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TUSAYAN MIGRATION TRADITIONS

BY

JESSE WALTER FEWKES

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TUSAYAN MIGRATION TRADITIONS

By Jesse Walter Fewkes

INTRODUCTION

The observant traveler in Arizona will often have his attention attracted by mounds of rock and earth, indicative of former habitations, which are widely distributed over this territory. These mounds, which are almost numberless, are the remains of villages formerly inhabited by sedentary populations, and are particularly abundant near springs or streams. Similar remains, varying in size from simple hillocks to clusters arranged in regular form, also occur in inaccessible canyons or on the tops of high mesas.

The architectural characteristics of ancient Arizonian ruins are not all alike. The dwellings are sometimes found in the form of caves hewn into a soft tufaceous rock, or as cliff houses built in caverns, or as pueblos constructed of adobe and situated in the plains.

The great number of these ancient habitations now in ruins would indicate a large aboriginal population if they were simultaneously inhabited, but it is generally conceded that many of them were only temporarily occupied, and that at no one time in the history of Arizona were they all peopled by the ancients. Although there is evidence against the synchronous inhabitation of all these villages, there is reason to believe that the sedentary population was in the past evenly distributed over the whole pueblo region, but that in the sixteenth and seventeenth centuries causes were at work to concentrate it into certain limited areas. One of these areas of concentration was the present Moqui reservation, to which the people of the ancient villages were forced for refuge from their foes. The Hopi villages were thus peopled by descendants of clans which once lived as far north as the territory of Utah, as far south as the Gila valley, and as far east as the upper Rio Grande. In these concentrated communities we may expect to find survivals of the culture of many of the ruined pueblos of Arizona, combined with that of colonies from the New Mexican villages of the Rio Grande and its tributaries. The problem

before the student of the history of any one of the Hopi pueblos includes the origin and course of migration of the different groups of clans whose descendants now form the population of those villages.

In preparing this paper the author has brought together such fragments of Hopi legendary history as could be gathered at Walpi. This account is not intended as a record of tribal genesis or creation myths, nor does it attempt a history from documentary sources of the dealings of the Spaniards or the Americans with the past or present inhabitants of this pueblo. It lays no stress on the discovery of Walpi by Europeans or the several attempts at mission work, but considers Hopi stories of the advent of different clans, the direction whence they came and the sequence of their coming, where they formerly lived, and the customs which they brought to the pueblo where their descendants now live. In other words, it is an attempt to examine the composition of the present population of Walpi by clans, and to trace the trails of migration of those clans before they reached the village. It is published as an aid to the archeologist who may need traditions to guide him in the identification of the ruins of northern Arizona,[1] and it is hoped that a discussion of the subject will bring into clear relief the composite origin of Hopi ritual, language, and secular customs.

It is impossible to interpret the Hopi ritual without a clear idea of the present relationship between the existing clans and of their connection with the religious societies. The growth of the Hopi ritual has gone on pari passu with the successive addition of new clans to the pueblo, and its evolution can not be comprehended without an understanding of the sociologic development and the clan organization of the pueblo. This applies also to the Hopi language and to secular customs which, like the ritual, are composite, and have resulted from the union of families of somewhat different stages of culture, each speaking a characteristic language. What the idiom of each of these several component clans was before their consolidation we can best judge if we know the sites of their ancestral homes and the speech of the early kindred from whom they separated when they migrated to the Hopi mesas. So also with their other customs and their arts, all of which are composite and were introduced some from one direction, others from another.

The legends which have served as the groundwork of this account of the history of Walpi were gathered mainly from the clans now living in the East mesa pueblos. Some of these legends have never been collected, although considerable work of great value which was done in this field by that enthusiastic student, the late A. M. Stephen,

[1] The main types of pueblo ruins have been described, and what is now necessary is a study of the manners and customs of the people who once inhabited them. This work implies an intimate knowledge of the ethnology of the survivors, and a determination of the survivors' identity may be had from migration legends of clans now living in the pueblos.

was published in Mindeleff's account of the architecture of Tusayan.[1] This material has been critically examined, and certain significant variations have been found which are embodied in the present article.

There remains much material on the migrations of Hopi clans yet to be gathered, and the identification by archeologic methods of many sites of ancient habitations is yet to be made. This work, however, can best be done under guidance of the Indians by an ethno-archeologist, who can bring as a preparation for his work an intimate knowledge of the present life of the Hopi villagers.

While engaged in collecting the migration legends of different Hopi clans the author has consulted, when possible, the clan chiefs. Wiki, Wikyatiwa, and Kopeli have furnished the migration legends of the Snake clans, Anawita those of the Rain-cloud, and Hani the Tobacco legends. Pütce has given the author the story of the Horn and Flute and Pautiwa that of the Eagle clans. The legends of the neighboring pueblo of Hano, the history of which is intimately connected with that of Walpi, were obtained from Kalakwai and others. As was to be expected, since human memory is fallible, different men of equal honesty vary considerably in their accounts, and hence the collector of the unrecorded history of Walpi soon recognizes that it is best not to give too much weight to stories of clans to which the informant does not belong. An honest traditionist immediately declares his ignorance of the history of a clan not his own, and in the presence of a man of that clan will refer to him when questioned. Some of the older men take a pride in the history of their respective clans, and claim to know more than others; but many know or care little of the history of their clans, and when interrogated refer to their clan chief. To this class belong most of the young men, especially those who have attended school, where little encouragement is given to pupils to gain knowledge of the history of their ancestors.

THE HOPI PUEBLOS

The present Hopi pueblos are seven in number, and are situated on three table-lands, called East mesa, Middle mesa, and Oraibi. The inhabitants of six of these villages speak the Hopi language and of one the Tanoan. The East mesa has two Hopi pueblos—Walpi and Sichumovi—and a Tewa village called Hano. About 7 miles in an air line from the East mesa is the Middle mesa, upon which are situated three towns, called Mishongnovi, Shipaulovi, and Shuñopovi. The largest Hopi pueblo, called Oraibi, is situated about 20 miles westward from Walpi.

Walpi is regarded as the most ancient Tusayan pueblo, its settlement dating from before the middle of the sixteenth century. The

[1] Eighth Annual Report of the Bureau of Ethnology.

neighboring pueblo, Sichumovi, was settled by foreign colonists about the middle of the eighteenth century, while Hano was founded by Tewa clans at the beginning of the same century.

Two of the Middle mesa pueblos are mentioned by name in documents of the seventeenth century, and one, Shipaulovi, was probably founded not far from 1750.

Oraibi is known to be an old pueblo, being also mentioned by name in early Spanish records; but it is more modern than Shuñopovi, having been founded by a chief named Matcito from the latter town.[1] The Hopi language as spoken in Oraibi is somewhat different in pronunciation from that of the other Hopi pueblos, but this difference is not more than dialectic, so that the six Hopi pueblos may be said to speak the same tongue. The people of Hano, however, speak a Tanoan dialect which the Hopi do not understand.

Sites of Old Walpi

The first site of Walpi on the East mesa which has been positively identified was on the northern side of the terrace which surrounds this rocky height, below the present town. The ground plan of this settlement is still clearly indicated by the remains of old walls, the size and arrangement of the rooms being still traceable without difficulty. This was probably the position of the pueblo in the sixteenth century, when its population was limited to the Snake, Horn, and Flute clans, and when the Spaniards first came into the country. It was also the site of the pueblo during the troubles with the inhabitants of the neighboring pueblo Sikyatki, which culminated in the destruction of the latter town.

The Walpians found this situation exposed to the attacks of their enemies, and consequently moved their pueblo one stage higher, to the top of the projecting spur at the western end of the mesa. On this site the Walpians lived through the mission epoch (1628–1680), and a chapel, the outlines of which may still be traced, was erected there. This second site of the pueblo is called Kisakobi, and the Spanish mission house Nücaki. As the walls of the first and second settlements almost adjoin, it may have been that portions of the two were inhabited synchronously.

The amount of débris around these former settlements indicates that both were inhabited for a considerable period, and evidently the size of the combined villages was not less than that of the present pueblo of Walpi. In this débris are found fragments of the finest old Tusayan ware, which bears pictography characteristic of the ancient epoch.

The inroads of the Ute from the north and the Apache from the south hastened the abandonment of the early sites, but probably the main cause of the final move to the top of East mesa was a fear of

[1] Matcito is said to have lived for some time in a cave near Oraibi, at a rock still pointed out.

the return of the Spaniards after the murder of the padres in the Pueblo revolt of 1680. The Hopi abandoned Kisakobi about the close of the seventeenth century and moved their habitation to the top of East mesa, where a few houses may already have existed. At that time they transported much of the building material from Kisakobi, using the beams of the mission for the roofs and floors of new kivas and houses, in which they may still be seen.

The name Walpi was apparently not applied to the settlement before this last change of location, which may account for its absence from Espejo's list of Hopi towns in 1583. The earliest documentary mention of Walpi was "Gualpi," in 1680, or about the time the pueblo was moved to its present site. Parts of Kisakobi and modern Walpi may have been simultaneously inhabited for several years, but between 1680 and 1700 the rooms at Kisakobi[1] were completely abandoned.

Effects of Spanish Contact

The advent of the Spaniards, in the middle of the sixteenth century, does not seem to have made a lasting impression on the Hopi, for no account of the first coming of Europeans is preserved in their stories. Undoubtedly the Hopi regarded these earliest visits in much the same manner as they did the frequent forays of the hostile Ute, Navaho, and Apache. They were no doubt profoundly impressed by firearms, and greatly astonished at the horses, but special stories of the incidents of that time have long ago been lost. There survive many accounts of the life of the Spanish priests of a later epoch, with references to the building of the missions, but none of the Hopi have a good word to say of this period in their history.

The influence of the zealous fathers in their attempts to convert the Hopi to Christianity seems to have been ephemeral. While the padres may have introduced some slight modifications into the native ritual, with more exalted ideas of God, as a whole the products of these changes, if there were any, can not now be disentangled from purely aboriginal beliefs and customs.

The new cult brought by the priests was at first welcomed by the Indians, and no objection was made to it, for toleration in religious things is characteristic of most primitive men. The Hopi objected to the propagandist spirit, and strongly resented the efforts of the padres to make them abandon their time-honored religious practices (as the making of dolls or idols and the performance of ceremonial dances), and to accept the administration of Christian baptism. The Hopi further declare that the early padres practically tried to enslave them or to compel them to work without compensation. They obliged the natives to bring water from distant springs, and to haul logs from the distant mountains for the construction of the mission buildings. Per-

[1] *Ki*, pueblo, *saka*, ladder, *obi*, locative: "Place of the Ladder-town."

haps sheep, horses, iron implements, and cloth were given in return for this service, or possibly they were not adequately paid. The Hopi maintain that they were not; but whether justly or not, time has not eradicated the feeling of deep hatred with which the Spanish mission epoch is now regarded by these Indians.

A few relics of the Spanish dominion still remain in Walpi. Some of the beams and flooring of the old mission are still to be seen in kivas and private houses,[1] and one or two old doors and windows date back to pre-American occupancy. There are also a few iron hoes—survivals of this early time—and metallic bells, the antiquity of which is doubtful. No Spanish written records are preserved in Tusayan, and nothing of Spanish manufacture has thus far been detected on any of the altars at Walpi. The lasting benefit of the Spanish régime was the gift of sheep, horses, goats, burros, and various fruits and seeds.[2]

CLANS LIVING OR EXTINCT IN WALPI AND SICHUMOVI

In the following lists the component clans of Walpi and Sichumovi are referred to their former homes:

1. Clans from Tokonabi (southern Utah): Tcüa (Snake), Ala (Horn).

2. Clans from Palatkwabi (southern Arizona) and the Little Colorado: Patuñ (Squash)[3], Leñya? (Flute), Patki (Cloud), Küküte (Lizard), Piba (Tobacco), Tüwa (Sand), Tabo (Rabbit).

3. Clans from the Muiobi (Rio Grande valley), and New Mexican pueblos, (Zuñi, Acoma, Jemez, etc.): Honau (Bear), Kokop (Firewood), Pakab (Reed), Asa (Tansy-mustard), Buli (Butterfly), Honani (Badger).

Although the original clans which settled Sichumovi belonged to group 3, and this is practically a New Mexican pueblo in the Hopi country, the descendants of the original settlers have so intermarried with the Hopi that their linguistic characteristics are lost.

1. Clans from Tokonabi

Tcüa group

Tcüa wiñwû	Snake clan.
Tohoû wiñwû	Puma clan.
Hüwi wiñwû	Dove clan.
Ucü wiñwû	Cactus clan.
Yuñû wiñwû	Opuntia (cactus) clan.
Nabovû wiñwû	———.

[1] Decorated beams from the mission may be seen in Pautiwa's house.

[2] The Hopi names of these, which are corrupted Spanish (*kanela*, sheep; *karayo*, horse; *melone*, melon, etc.), show the sources of these inestimable gifts which have profoundly modified the modern life of the Hopi.

[3] Extinct in Walpi and Sichumovi.

1. Clans from Tokonabi—Continued

Ala clans of the Ala-Leñya group[1]

Ala wiñwû ....Horn clan.
Sowinû wiñwû.........Deer clan.
Tcübio wiñwû ....Antelope clan.
Tcaizra wiñwû ....———.

2. Clans from Palatkwabi and the Little Colorado

Patuñ group

Patuñ wiñwû ....Squash clan.
Atoko wiñwû ....Crane clan.
Kele wiñwû ....Pigeon-hawk clan.
Tubic wiñwû ....Sorrow-making clan.

Leñya clans of the Ala-Leñya group[1]

Cakwaleñya wiñwû....Blue- (Green-) flute clan.
Macileñya wiñwû......Drab-flute clan.
Pañwû wiñwû.........Mountain-sheep clan.
Leleñtu wiñwû ....Flute clan.

Patki group

Patki wiñwû ....Rain-cloud clan.
Kaü wiñwû ....Maize clan.
Tanaka wiñwû ....Rainbow clan.
Talawipiki wiñwû .....Lightning clan.
Kwan wiñwû..........Agave clan.
Sivwapi wiñwû........*Bigelovia graveolus* clan.
Pawikya wiñwû ....Aquatic-animal clan
Pakwa wiñwû.........Frog clan.
Pavatiya wiñwû ....Tadpole clan.

Tüwa-Kükütc group

Tüwa wiñwû..........Sand clan.
Kükütc wiñwû........Lizard clan.
Sihu wiñwû...........Flower or bush clan.

Tabo-Piba group

Tabo wiñwû ....Rabbit clan.
Sowi wiñwû...........Hare clan.
Piba wiñwû...........Tobacco clan.

[1] The Ant clans (Anu, Tokoanu, Wukoanu, and Ciwanu) belong to this group, but the author is in doubt whether to assign them to the Ala or the Leñya division, the latter of which did not come from Tokonabi.

3. Clans from Muiobi and New Mexican Pueblos

Honau group

Honau wiñwû..........Bear clan.
Tokotci wiñwû........Wildcat clan.
Tcosro wiñwû..........Bluebird clan.
Kokyan wiñwû ....Spider clan.

Asa or Tcakwaina group (Abiquiu, via Zuñi)

Tcakwaina wiñwû ......Tcakwaina (a katcina) clan.
Hosboa wiñwû ....Road-runner or Pheasant clan.
Pociwû wiñwû ....Magpie clan.
Tcisro wiñwû ....Bunting clan.

Katcina group (via Kicuba)

Katcina wiñwû.........Katcina clan.
Añwuci wiñwû.........Crow clan.
Gyazru wiñwû ....Parrot clan.
Sikyatci wiñwû ....Yellow-bird clan.
Tawamana wiñwû ......Bird clan.
Salab wiñwû ....Spruce clan.
Sühüb wiñwû..........Cottonwood clan.

Kokop group (Jemez, via Sikyatki)

Kokop wiñwû..........Firewood clan.
Isauû wiñwû ....Coyote clan.
Kwewû wñwû..........Wolf clan.
Sikyataiyo wiñwû ......Yellow-fox clan.
Letaiyo wiñwû ....Gray-fox clan.
Zrohono wiñwû ....———.
Masi wiñwû............Masauû (Death-god) clan.
Eototo wiñwû..........Eototo clan.
Tuvoû wiñwû ....Piñon clan.
Hoko wiñwû............Juniper clan.
Awata wiñwû ....Bow clan.
Sikyatci wiñwû ....Bird (?) clan.
Tüvatci wiñwû ....Bird (?) clan.

Pakab group

Pakab wiñwû ....Reed or arrow clan.
Kwahu wiñwû ....Eagle clan.
Kwayo wiñwû ....Hawk clan.
Koyoña wiñwû.........Turkey clan.
Tawa wiñwû ....Sun clan.
Püükoñ wiñwû.........War-god clan.
Palaña wiñwû..........War-god clan.
Cohu wiñwû ....———.

Honani group (via Kicuba)

Honani wiñwû.........Badger clan.
Muiyawu wiñwû ....Porcupine clan.
Wicoko wiñwû.........Turkey-buzzard clan.
Buli wiñwû ....Butterfly clan.
Katcina wiñwû.........Katcina clan.

CHRONOLOGIC SEQUENCE OF THE ADVENT OF CLANS

Traditions regarding the sequence of the arrival of clans conflict in details, although they coincide in general outline. Anawita, one of the best informed men of the Patki clans, has given the following order of the arrival of clans at Walpi:

1. Honau, Bear.
2. Tcüa, Snake.
3. Ala-Leñya, Horn-Flute.
4. Kokop, Firewood.
5. Pakab, Reed.
6. Asa, Tansy-mustard.
7. { Patki, Cloud.
Küküte, Lizard; Tüwa, Sand.
Tabo, Rabbit; Piba, Tobacco.
8. Honani, Badger; Buli, Butterfly; Katcina.

It will be noted that Anawita does not mention the Squash clan, probably because it is now extinct at Walpi:

Wikyatiwa, of the Snake clan, gave the following sequence:

1. Tcüa, Snake.
2. Honau, Bear.
3. Kokop, Firewood.
4. Pakab, Reed.
5. Ala-Leñya, Horn-Flute.
6. { Patki, Cloud.
Küküte-Tüwa, Lizard-Sand.
Piba-Tabo, Tobacco-Rabbit.
7. Honani, Badger.
8. Katcina.
9. Asa, Tansy-mustard.

Poyi, a very intelligent man of the Okuwuñ or Tewa Rain-cloud clan, gave the following sequence:

1. Tcüa, Snake.
2. Honau, Bear.
3. Patuñ, Squash.
4. Ala-Leñya, Horn-Flute.
5. Kokop, Firewood.
6. Asa, Tansy-mustard.
7. Isauû, Coyote.
8. { Patki, Cloud.
Küküte-Tüwa, Lizard-Sand.
Piba-Tabo, Tobacco-Rabbit.
9. { Katcina.
Honani, Badger.

The late A. M. Stephen obtained, in 1893, from five chiefs now dead,[1] the following sequence:

1. Honau, Bear.
2. Tcüa, Snake.
3. Patuñ, Squash.
4. Ala-Leñya, Horn-Flute.
5. { Patki, Cloud.
Tüwa-Küküte, Sand-Lizard.
Tabo-Piba, Rabbit-Tobacco.
6. { Kokop, Firewood.
Pakab, Reed.
7. { Honani, Badger.
Katcina.
8. Asa, Tansy-mustard.
9. The clans of Hano pueblo.

Some of the inconsistencies in the foregoing lists may be explained by the fact that a misunderstanding existed between the natives and the author in regard to the information desired, the former believing in some instances that the sequence of arrival of clans at Walpi, and in others that the order of their advent into Tusayan, was desired.

[1] Cimo, Masaiumtiwa, Nasyuñweve, Hahawe, and Intiwa.

Evidence has now been gathered that other villages than Walpi existed in the Hopi country at the time of the arrival of the Tcüa clans. Studies of the ruin of Sikyatki show that this pueblo was older than Walpi, and consequently that the Kokop clans which founded it came into the Hopi country before the Tcüa. The Leñya were also in this region when joined by the Ala (who left Tokonabi with the Tcüa clans) and probably were living at Leñyanobi. Moreover, there is every reason to suspect that Awatobi also was inhabited in that early epoch.

Bearing on these probabilities, the testimony of one of the Ala men, who did not confuse the Hopi country with the pueblo of Walpi, but called the author's attention to the error of such confusion, is highly important. In his account of the sequence he declared that the Honau clan was the first to settle Walpi; but that about the same time the Kokop clan founded Sikyatki and the Leñya clan Leñyanobi. The Ala and Tcüa peoples came into the country at about the same time, by different routes, the former joining the Leñya at Leñyanobi and the latter the Honau at Walpi. Sikyatki and Awatobi were in existence at that time. Although the Honau clan had not been at enmity with the Kokop, as both came from Muiobi (Rio Grande) and Jemez, the pueblo of combined Tcüa and Honau clans was not on amicable terms with the people of Sikyatki. The outcome of the hostilities which followed was the overthrow of the Kokop clan of Sikyatki, "while the Honau-Tcüa people of Walpi conquered Masauû, the tutelary god of Sikyatki, who had given the Kokop a site for their pueblo." The combined clans of the Ala-Leñya pueblo gained kinship with the Honau-Tcüa through the Ala who had lived with the Tcüa at Tokonabi. These two pueblos were peacefully united by the moving of the Ala-Leñya to Walpi. The tragic overthrow of Awatobi by its rival, Walpi, occurred later.

Thus it seems that at an early period there had settled in the Hopi country three groups of clans, the Honau, the Kokop, and the Leñya and kindred Patuñ. The Honau had a pueblo on the site of Walpi; the Kokop were settled at Sikyatki; the Patuñ on the Middle mesa; and the Leñya at Leñyanobi or Kwactapahu. The kindred Tcüa and Ala clans, which had previously lived together at Tokonabi, entered the country by different routes. The Tcüa joined the Honau at Walpi; the Ala the Leñya at Leñyanobi or Kwactapahu. The Honau-Tcüa and the Ala-Leñya later consolidated at Walpi, and the town of the latter was abandoned. The combined people of Walpi destroyed the Kokop settlement at Sikyatki, as above stated, adding some of the survivors to its population. With the assistance of the Middle mesa clans Walpi overthrew and destroyed Awatobi. The settlement of Patki people at Pakatcomo was abandoned, some of the clans from that place removing to Walpi. The Honani, Asa, and other eastern clans sought Walpi as a home. The details of the above history are best brought out by an intimate discussion of each clan legend.

It may then be stated that while the main bodies of the three groups of clans from the north (Tokonabi), the south (Palatkwabi), and the east (Muiobi), settled at Walpi in the sequence given, individual clans of these groups were, so far as is known, of equal antiquity there; thus, while the majority of the clans from the Rio Grande were late arrivals, the Honau and Kokop were among the first to settle at the East mesa.

The author has chosen the advent of the Snake clans as the epoch of the founding of modern Walpi, and for consecutive history he will consider the arrival of the clan groups in their order, namely, from Tokonabi, Palatkwabi, and Muiobi.

CLANS FROM TOKONABI

Tcüa Clans

The clans known as the Tcüa and the Ala[1] say that they formerly lived together at Tokonabi, which place, so far as can be learned, was near the junction of the Little Colorado with the Great Colorado, in southern Utah. The Tcüa, or Snake, clans were dominant from the very first in Walpi, and their chief was, as late as the end of the seventeenth century, governor of the pueblo, for he it was who is said to have sent to the Tewa people of the Rio Grande for aid against hostile nomads.

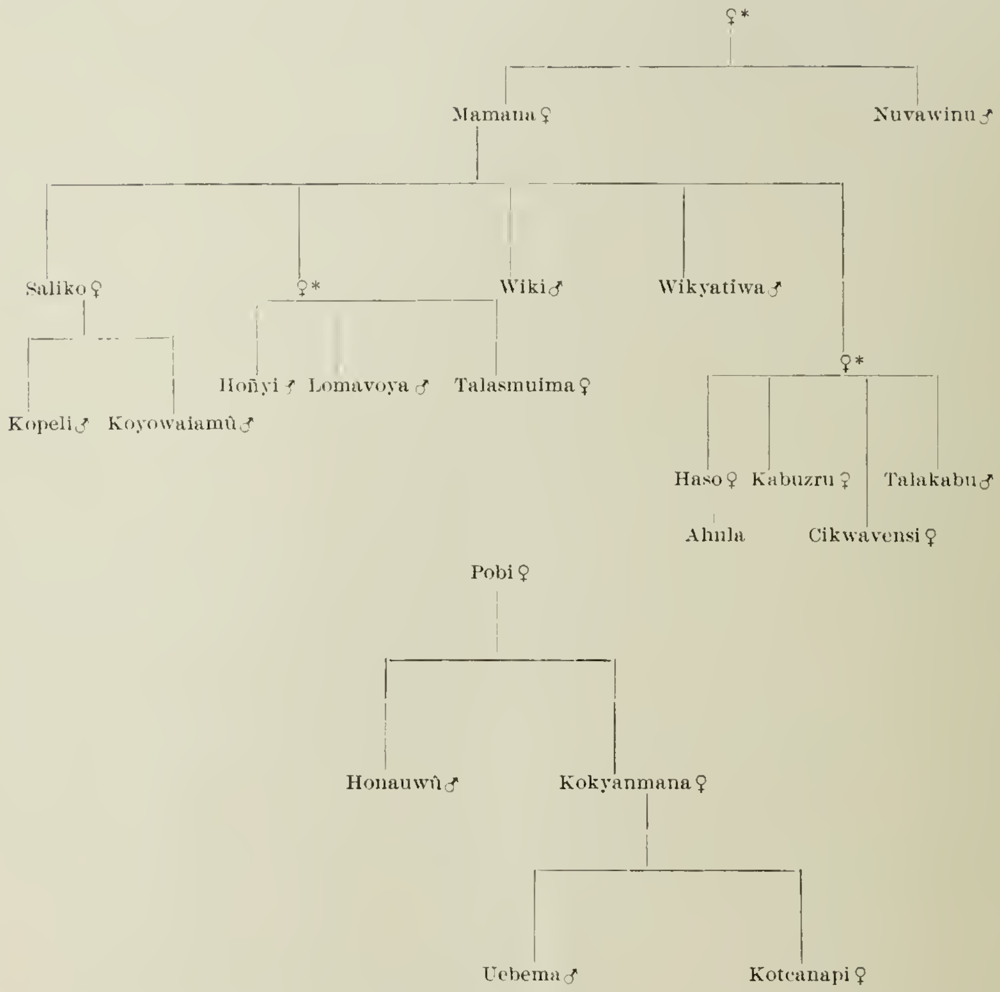
The following list contains the names of the men and women of the Snake clans now (January 1, 1900) living at Walpi:

Census of Tcüa clans at Walpi

Men and boys	Women and girls
Kopeli[a]	Mamana
Koyowaiamû	Saliko
Nuvawinu	Pobi
Hoñyi	Kokyanmana
Lomavoya	Kotcanapi
Honauwû	Talasmuima
Wiki	Haso
Wikyatiwa	Kabuzru
Uebema	Cikwavensi
Ahula	
Talakabu	
Sanna	
Sikyahoniwa	
Moumi	
Tcoko	

[a] Since deceased.

[1] The Ala, by union with the Leñya, later became the Ala-Leñya. There is no evidence that the latter clan ever lived at Tokonabi.



The different clans which, according to the legends, are associated with the Snake people are mentioned in an accompanying list (page 582). When the Snake settlement was first made at the northern base of the East mesa, the Snake, Puma, Dove, and Cactus peoples were possibly all represented, but the Snake clan was dominant and its chief was governor of the town.

In their former life at Tokonabi the Huwi (Dove), Toho (Puma), Ala (Horn), and Tcüa (Snake) were associated, and in some accounts the Tüwa are also said to have been represented in this northern home. In most of the Patki traditions the Tüwa are asserted to be a southern clan closely related to the Kükütc (Lizard) people.

The burden of the Snake legend[1] is that in ancient times, when the Puma, Dove, and Horn clans lived at Tokonabi, a youth of the first named brought home as his wife a girl of the Snake clan. One of his "brothers," but of the Horn clan, also married a girl of the Snake clan, and it would seem that other members of the girl's clan joined the Puma-Horn settlements. In passing, it may theoretically be sup-

[1] This legend is couched in the form of a mythic story of the adventures of the god Tiyo in the Underworld.

posed that these women were of Shoshonean affinity, possibly from a nomadic tribe, with which the Puma and Horn were thus united.

As the offspring of the two Snake women did not get along well with the children of other clans at Tokonabi,[1] the Puma, Snake, and Horn clans migrated southward. They started together, but the Horn soon separated from the other clans, which continued to a place 50 miles west of the East mesa, and built there a pueblo now called Wukoki. The ruins of this settlement are still to be seen.

While the Puma and Snake clans were living at Wukoki one of their number, called Tcamahia, left them to seek other clans which were said to be emerging from the Underworld in the far east. He went to the Upper Rio Grande to a place called Sotcaptukwi, near Santa Fe, where he met Püükoñhoya, the war god, to whom he told the object of his quest. This person shot an arrow to a *sipapu*, or orifice, in the north, where people were emerging from the Underworld. The arrow returned to the sender, bringing the message[2] that the clans to which it was sent would travel toward the southwest, and that Tcamahia should go westward if he wished to join them. He followed this direction and met the clans at Akokaiobi,[3] the Hopi name of Acoma, where, presumably, he joined them, and where their descendants still live.

In answer to a question as to the identity of Tcamahia, the narrator responded that the name signified the "Ancients." As the same term is used for certain ceremonial objects on the Antelope altar in the Snake dance, it may be possible, by a study of this ceremony, to give a more intelligent answer. Around the sand picture which constitutes an essential feature of this altar there is arranged a row of stone celts which are called tcamahias. During the altar songs one of the priests of the Sand clan, which is said to have lived with the Snake clan at Wukoki, rapped on the floor with one of these stone objects, for the purpose, it was said, of telegraphing to Acoma to the Tcamahia to join them in the Snake ceremony. On the eighth and ninth days of the dance Tcamahia came, and, while acting as asperger at the kisi or brush shelter, called out the invocation "*Awahia, tcamahia*," etc., the Keres invocation to warriors.

The author is of the opinion that this asperger personates the old Tcamahia of Wukoki, who parted from the Snake clans at that pueblo to seek his fortune in the east, finding it at Acoma. Among the clans associated with the Snake at Wukoki were the Puma and Sand. Perhaps Tcamahia, the warrior, belonged to one of these, possibly the former. The Puma fetish on the Antelope altar at Walpi may also be interpreted as indicative of a former association of the Puma and the

[1] Tokonabi, possibly from *toktci*, wild-cat, and *obi*, the locative.
[2] This reminds us of the use of the paho, or prayer stick, as a message bearer.
[3] There is said to be a ruin on the Awatobi mesa called Akokaiobi.

Snake clans, and the sand picture of the mountain lion on the Snake altar of the same pueblo may admit of the same interpretation. The personation of the Puma-man in the exercises in the Snake kiva is regarded in the same way. These are all modern survivals indicative of the former association of Puma and Snake clans.

Evidences of the contact of the Horn and Snake clans are also found in the ceremonial paraphernalia of the Snake dance, such as the two antelope heads on the Antelope altar at Oraibi and the many snake fetishes, to which it is hardly necessary to call special attention. But the strongest of all evidences that the Horn and Snake clans have been associated are the Hopi names of the two priesthoods which celebrate this great festival, namely, the Antelope and Snake fraternities.

Thus in the Snake dance we find in the ceremonial paraphernalia totemic evidences of composition from at least three clans—the Puma, the Horn, and the Snake—which substantiates the legend that in ancient times these three lived together. When we study the Flute ceremony we shall see additional evidence that the Horn were once in contact with the Snake clans, notwithstanding that the Flute element, which predominates, had an origin different from that of the Horn.

Ala-Leñya Clans[1]

The first addition to the settlement of Bear and Snake clans at Old Walpi was a group composed of Ala (Horn) and Leñya (Flute) clans. As this group was composite, their legends are likewise composed of at least two elements. They go back to two cultus heroes, the Deer youth and the Mountain-sheep youth, one of whom is the boy of the Horn clan who married one of the Snake girls, the other the male ancestor of the Flute clans.

The numerous elements of the legends of the Horn-Flute clans which run parallel with those of the Snake are interpreted as due to the former life of the Horn with the Snake clans. The Flute legendists say that their ancestor descended to the Underworld, and that while there he drew a maid to him by playing on a flute. He married this girl in the Sun-house and she became the mother of the Flute clan. This legend is thought to bear traces of a different origin from any of the Horn legends, although it is mixed with Horn stories.

After the Horn clans parted from the Snake people in their migration southward from Tokonabi, they drifted into an eastern place called Lokotaaka. How far eastward they went is not known, but from Lokotaaka they moved to Kisiwi, and then to Moñpa, where ruins are still to be seen. Continuing in their migration, which, after they left Lokotaaka, was toward the west, they came to a pueblo called Leñyanobi, "Place of the Flute" (clans). There they evidently

[1] As has been previously stated, the Leñya clans of the Ala-Leñya group came from Palatkwabi, but for convenience they are here considered with their associated clans from Tokonabi.

united with the Flute people, and from that time the group was composite. The combined clans did not remain at Leñyanobi, but moved by way of Wikyaobi to a point called Kwactapabi, where they were well within the present Hopi reservation. The route from Kwactapabi to Walpi, where they joined the Snake pueblo, was by Wipo, Kanelba, and Leñyacüpu, or Kokyanba (Spider spring).

The spring known as Kwactapahu, situated a few miles from Walpi, is said to have been the site of a pueblo of the Horn-Flute clans for some time, and it was possibly while they were there that news of the Snake settlement at Walpi reached them. The chief of the pueblo sent Alosaka to spy out the country west and south of their settlement, and he returned with the report of the existence of the Snake town at Old Walpi. The Horn people, knowing that the Snake people must have made their way into the region after their separation, no doubt expected to find them as they journeyed westward. At all events, they recognized them as kindred. Kwactapahu was abandoned, and the combined Horn-Flute clans were hospitably received by the Snake villagers.

In the present Hopi ritual at Walpi there is a remarkable confirmation of that part of the above legend which deals with the union of the clans from Kwactapahu and the people of Old Walpi. It is no less than a dramatization of the event with a cast of characters representing the participants.

About noon of the seventh day of the Flute ceremony, the Flute chief, accompanied by several members of the Flute priesthood, visited in sequence the springs mentioned above, where the Horn-Flute people had tarried during the latter part of their migration. They went first to Kanelba, about 5 miles from Walpi, thence to Wipo, still farther to the north, on the west side of the table-land of which the East mesa is a continuation. They then crossed the plain west of Wipo, and made their way onto the mesa which bounds the western edge of this plain. At a point called the Flute house they slept, and on the following morning went a mile beyond the Flute house to Kwactapahu, where ceremonies were conducted and offerings made to the spring.

The rites at Kwactapahu ended, the Flute priests retraced their steps, crossing the valley as their ancestors did in ancient times. At intervals they halted, set the tiponi or badge of office in position on the ground, and made symbols of rain clouds near by. One of the stopping places was near the mound called Tukinobi, on which there is a ruin of considerable size. They continued their course and approached the narrow neck of land called Hütciovi, along which runs the trail by which Walpi is entered from the north. There they found a line of meal drawn across the trail which symbolized that no one could enter the pueblo. Entrance to Walpi was closed to the incoming personators of the ancient Horn-Flute clans.

Back of this line, between it and the houses of the pueblo, stood the chiefs of the Bear and Snake clans. There was also a boy dressed like the Snake boy in the Antelope kiva rites, as well as two girls dressed and decorated similarly to the Snake maid in the same ceremony. As the Flute chief and his followers approached, the Bear chief challenged him, demanding, "Who are you? Whence have you come?" The Flute chief responded that they were kindred and knew the songs necessary to bring rain. Then the Bear chief took his tiponi from one of the girls, while the Antelope-Snake chief received his badge from the other. Holding them tenderly on their arms, they advanced and welcomed the Flute chief to their pueblo. As a symbol of acceptance the Flute chief gave prayer offerings to the girls, the line of meal barring entrance to the pueblo was brushed away, and a new line extending along the trail was made to symbolize that the entrance was again open.

This symbolic reception of the Flute priests not only dramatizes a historic event in the growth of Walpi, but also displays a tendency to visit old sites of worship during ceremonies, and to regard water from ancient springs as efficacious in modern religious performances. It is a common feature of great ceremonies to procure water from old springs for altar rites, and these springs are generally situated near ancestral habitations now in ruins.

This tendency is illustrated in the Sio-calako or Zuñi Calako ceremony celebrated at Sichumovi in July, when the chiefs procure sacred water from a spring near St Johns, Arizona, called Wenima, the ancient home of the Hopi and Zuñi Calako. The Kwakwantû chief obtains water for some of his ceremonies from a spring called Sipabi, where the Patki clans, who introduced the Kwakwantû, once lived. The Piba chief of the Tataukyamû procures water from Clear creek, near the ruin of Cakwabaiyaki, the former home of the Piba clans. Thus in instances where clans have migrated to new localities their chiefs often return to ancestral shrines, or make pilgrimages to old springs for the purpose of procuring water to use in their ritual.

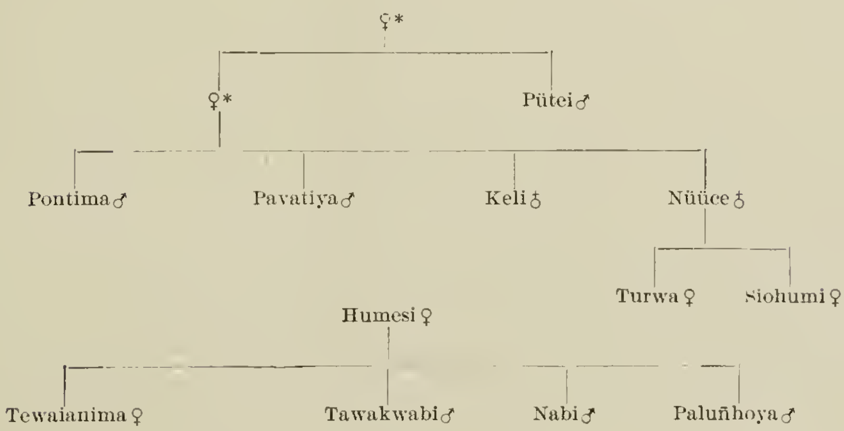
Ala-Leñya (*Walpi*)

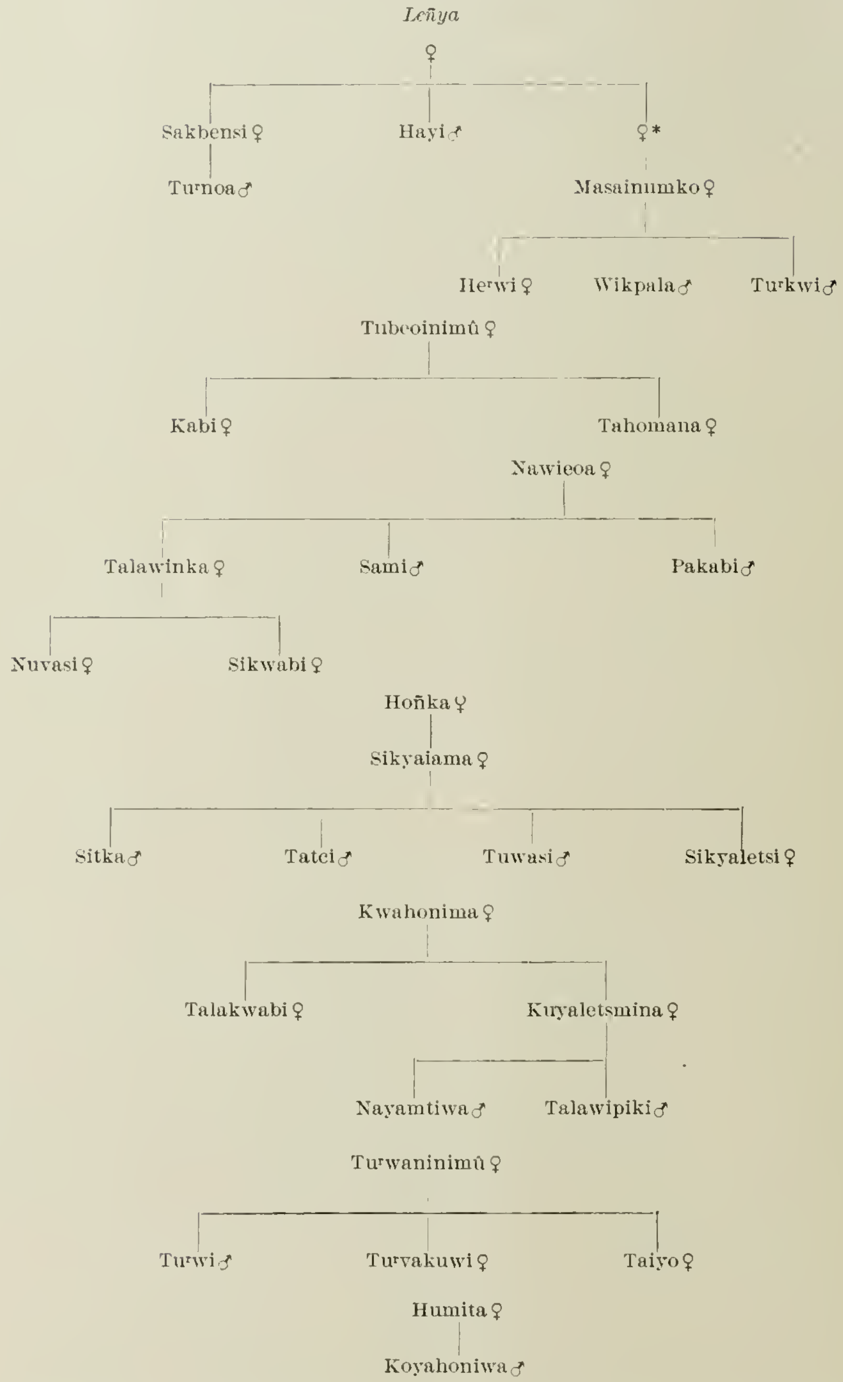
Men and boys	Women and girls
Ala phratry:	
Pontima	Keli
Pavatiya	Nüüce
Pütci	Turwa
Tawakwabi	Siohumi
Nabi	Humesi
Paluñhoya	Komañaieci
Makto	Talahoniwa (Tüba)

Ala-Leñya (*Walpi*)—Continued

Men and boys	Women and girls
Ala phratry—Cont'd	
Suhimu	Tewaianima
Sokoni	
Nüuñu	
Sikyabentima	
Tcono	
Pema	
Honyamtiwa	
Leñya phratry:	
Tu^{r}noa	Sakbensi (Vensi)
Tu^{r}kwi	Tu^{r}waninimû
Wapa	Masainumko
Hayi	Talawinka
Wikpala	Humita
Nitioma	Tahomana
Tatci	Kabi
Sami	Hoñka
Pakabi	Kwahonima
Lomaventiwa	Talakwabi
Tuwasi	Kuyaletsmina
Sitka	Sikyaiama
Koyahoniwa	He^{r}wi
Nayamtiwa	Nawicoa
Talawipiki	Tubeoinimû
Sikyaiauma	Nuvasi
Tu^{r}wi	Sikwabi
Taiyo	Sikyaletsi
	Tu^{r}vakuwi

Ala





CLANS FROM PALATKWABI AND THE LITTLE COLORADO PUEBLOS[1]

It is stated that the Little Colorado pueblos were settled by clans from the far south, or Palatkwabi, which accounts for their consideration under the above heading. There is good traditional and docu-

[1] By the Little Colorado pueblos the author does not refer to ruins at the Cascades or between them and the river's mouth. The pueblos south and southeast of Hopi are included.

mentary evidence that some of the pueblos now in ruins along the Little Colorado, due south of Walpi, were inhabited until near the close of the seventeenth century, but they were not all abandoned at the same time. Some of the clans went northward to the Hopi pueblos, others eastward to Zuñi. Among the first groups to migrate northward was the Patuñ (Squash), which may have been accompanied by the Leñya or Flute. The former settled at the Middle mesa and Awatobi, the latter were later joined by the Ala at Leñyanobi. As there were Patuñ clans in Awatobi, which was destroyed in 1700, this migration must have taken place before that year.

The Patki group left Homolobi somewhat later, for it is said that they did not go to Awatobi, but as there were Piba clans in Awatobi, the Piba arrived in Tusayan before the destruction of the pueblo of the Bow people. It may have been that Pakatcomo, the Patki settlement in Tusayan, was founded before Awatobi fell, but the evidence seems to be contrary to such conclusion.

Patuñ Clans

Among the first clans to migrate from the pueblos of the Little Colorado in quest of homes in northern Tusayan of which information has been gathered through legends were the Patuñ or Squash clans. They originally lived on the Little Colorado, southwest of the present Hopi pueblos, and were accompanied by the Atoko (Crane) and Kele (Pigeon-hawk) clans. They made a settlement at Tcukubi, on the Middle mesa, which was afterward abandoned, the inhabitants removing to another pueblo of Squash clans, Old Mishongnovi. Some of the Squash clans went to Awatobi and others eventually to Walpi. The Squash clans which went to the East mesa are now extinct, so that it has not been possible to investigate their legends, but ample material for this study is still extant at the Middle mesa villages.

In their life along the Little Colorado the Squash clans came in contact with many others, some of which followed them in their northward migration. There is reason to believe that among those they met were the Leñya clans, which may have preceded them in the journey. There are several reasons for associating the Leñya with southern clans. In the Oraibi Flute altar the main image is a figurine with a single horn on the head resembling the pointed helmet worn only by the Kwakwantû, a society of the Patki clan, the southern origin of which is unquestionable. In most of the Flute altars there are two mounds of sand (*talactcomo*, "pollen mound") in which artificial flowers are inserted. The construction of similar flower mounds (*atkya sitcomovi*) in the Underworld is mentioned in Piba and Patuñ legends of the origin of their Tataukyamû, Wüwütcimtû, and Mamzrautû societies. The Patuñ legends contain much about the cult of Alosaka (a germ god),[1]

[1]Alosaka is really another name for Muyiñwû, the germ god.

which they say originated in the south. The personation of Alosaka is prominent in the Flute observance at Walpi.

This Alosaka cult, which, as elsewhere shown, is in some way connected with the Mountain-sheep clan of the Flute group, is one of the most perplexing at Walpi. There is legendary evidence that Alosaka was introduced into Tusayan from the settlements along the Little Colorado, by Squash and kindred (Flute) clans, some of which joined the Horn, others went to Awatobi, and still others to the Middle mesa, where they founded Tcuknbi and other pueblos. All the evidence would appear to indicate that the original home of this cult was in the south, and as the Squash and related clans (except the Flute) are extinct at Walpi, the perpetuation of the Alosaka ceremonies in that pueblo has fallen to other clans—the Asa and Honani—by which the nature of the cult has been somewhat modified.

In the enumeration of the clans belonging to the Ala-Leñya group, there is a Pañwü or Mountain-sheep clan. This fact is significant, as the Aaltû or Alosaka wear artificial horns and personate Mountain-sheep in several ceremonies.

In the New-fire ceremony, where Alosaka are personated, the personations observe rites at the shrine of a being called Tuwapoñtumsi ("Earth-altar woman"). The shrine has no statue of this being, but contains simply a block of petrified wood. Sikyahonauwû, an old man of the Tüwa clan, made for me as his totem a figure with two horns, which he called Tuwapoñtumsi, a female complement of the double-horned Alosaka.

In the Soyaluña, or Winter-solstice ceremony, we find a figure of Alosaka on the shield of the Ala-Leñya people, and at Oraibi a screen similarly decorated is found. It has not yet been determined, however, whether this Alosaka screen at Oraibi has any relation to the Ala-Leñya clans.

The Alosaka cult was practiced at Awatobi, for the figurines of Alosaka used in that pueblo, as well as legends connected with them, are known. This is explained on the theory that there were Patuñ and related Leñya clans in that ill-fated pueblo.

Patki Clans

In the general designation "Patki clans" are included the last group which sought refuge from their southern homes among the Hopi. This group includes the Kükütc (Lizard), called also Tüwa (Sand), the Tabo (Rabbit) and Piba (Tobacco), and the Rain-cloud. They say that they once lived on the Little Colorado, near Winslow, and when they entered the Walpi valley they built and occupied Pakatcomo, where they practiced a higher form of religion than that which existed in the pueblo founded by the Bear and Snake clans. An intimate study of the character of the surviving rites which these clans say they

introduced substantiates this claim of their legends, for all the ceremonies ascribed to southern clans are higher than the rite which came from Tokonabi.

The original home of the Patki clans is called in their legends Palatkwabi, and is said to have been near San Carlos in the Gila valley, southern Arizona. The legends of this clan say that their ancestors were forced to leave their ancient home by reason of destructive floods, due to Palülükoñ, the Great Snake, and they migrated northward along the trail indicated by the ruined pueblos mentioned in the following pages. From Kuñchalpi, the most ancient pueblo of the Patki, probably, in the Palatkwabi region, they went on in turn to Utcevaca, Kwiñapa, Jettipehika (the Navaho name of Tcübkwitcalobi, or Chaves pass), Homolobi (near Winslow), Sibabi (near Comar spring), and Pakatcomo (4 miles from Walpi). The last four ruins have been identified, and extensive archeological investigations have been conducted at the fourth and fifth.

We thus have the names of three pueblos occupied by the Patki during their northern migration from Palatkwabi, before they arrived at Chaves pass, which have not yet been identified. These are Kwiñapa, Utcevaca, and Kuñchalpi. The determination of the sites of these villages, and a study of their archeology, would prove to be an important contribution to the knowledge of the origin of the Patki clans. Anawita, chief of the Patki, a very reliable man, can point them out to any archeologist who has the means to prosecute these studies in Arizona. When the Patki clans arrived in Tusayan they built the pueblo of Pakatcomo, from which some went to the Middle mesa and others to Walpi. The Patki traditionists say that when their ancestors lived at Pakatcomo the people of Walpi were in sore distress on account of the lack of rain and the consequent failure of crops, hence they invited the Patki to perform their rites to relieve them from calamity. This invitation was accepted, and the Patki societies erected their altars and sang their rain songs at Tawapa. As a result there came over the land first a mist, then heavy rain with thunder and lightning. Although the latter alarmed the Walpi women, the men were grateful, and the Patki were admitted to the pueblo, which they later joined.

There was probably also another reason for the abandonment of Pakatcomo. The pueblo was in a very exposed position, and the Apache were raiding the surrounding country, even up to the very foothills of the East mesa. Pakatcomo was in the plain, and its inhabitants naturally sought the protection of Walpi on its inaccessible mesa site.

Pakatcomo is a small ruin, with walls of stone, and closely resembles the ruins at Homolobi, but it was evidently not inhabited for a long time, as the quantity of débris about it is small, and there are only a few fragments of pottery in its mounds.

Date of the removal of clans from Homolobi

Historical documents of the sixteenth and seventeenth centuries point to the existence at that time of inhabited pueblos in the region west of Zuñi and south of the present Hopi towns. We find constant references to the "Cipias" as living west of Zuñi in the seventeenth century, but the name drops out of history in the century following.[1] Where did they go? Probably to Pakatcomo. In 1604 Juan de Oñate, in search of the South sea (the Pacific), marched *westward* from Zuñi to "Mohoce" 12 or 14 leagues, where he crossed a river. This Mohoce is generally said to be modern Tusayan, which, unfortunately for the identification, is not west but northwest of Zuñi, is three times the distance mentioned, and is not on a river. Moreover, to visit the South sea, Oñate had no reason to go to the northern or modern Hopi pueblos. He had been there in 1598, and had gone from them to the mines north of Prescott and returned to Zuñi by a "shorter" route. Why should we suppose that he went out of his way from a direct route to the South sea on a subsequent journey? The line of march of Oñate in 1604 was stated to be from Zuñi west to Mohoce, which name is not restricted by the author to the present Hopi pueblos. The pueblos along the Little Colorado were in Mohoce, for, as we shall see, the Gileños told Fray Francisco Garces in 1775 that "la nacion Moquis" formerly extended to Rio Gila.

In 1632 the Little Colorado settlements were still occupied, but by the middle of the seventeenth century the Apache had raided the territory between the settlements of sedentary Sobaipuri tribe of the San Pedro and those of the Hopi along the Little Colorado, preventing the trade between the tribes which had been common in the sixteenth century. In 1674 the hostiles had destroyed a Zuñi pueblo, and there is every reason to believe had forced the clans in the Little Colorado valley northward to modern Tusayan. It is therefore highly probable that the pueblos in the neighborhood of Winslow were deserted in the latter half of the seventeenth century.

The "Kingdom of Totonteac," which is mentioned in documentary accounts written in the sixteenth century, is now generally regarded as the same as Tusayan, but neither name was restricted to the present Moqui reservation in early times. There is every reason to suppose that when Coronado marched through New Mexico in quest of Cibola, the pueblos along the Little Colorado south of Walpi were inhabited, and that there were other inhabited pueblos, now in ruins, south of these. Totonteac may have been the name of one of these clusters[2] possibly as far south as Verde valley or Tonto basin; but

[1] In talking over traditions with Suñoitiwa, a member of the Asa clan, the author found that he placed the home of the Cipias or Zipias south of Laguna and east of Zuñi. Whether these were related to the Cipias west of Zuñi was not known to him.

[2] Tusayan extended far south of Walpi in the sixteenth century. According to Castañeda it was 25 leagues from Cibola, which distance he later reduces in his account to 20 leagues. Espejo says that Zuñi is another name for Cibola. Now, 20 leagues from Zuñi, in the direction indicated, would not bring one to Walpi in northern Tusayan, but to some other Tusayan pueblos, possibly Homolobi.

Captain Melchior Diaz learned from the natives that "Totonteac lies about seven days' easy journey from Cibola. The country, the houses, and the people are of the same appearance as in Cibola. Cotton was said to grow there well, but I doubt this, for the climate is cold. Totonteac was stated to contain twelve towns, each of them greater than Cibola."[1]

The above quotation is from Mendoza's letter of April 17, 1540, but on August 3 of the same year Coronado wrote to Mendoza that the Cibolans informed him that the kingdom of Totonteac was "a hotte lake on the edge of which there are five or six houses." In the same letter Coronado says: "They tell me about seven cities which are at a considerable distance. . . . The first of these four places about which they know is called Tucano."[2]

Certainly, if we judge from the contents of this letter, Coronado's informants did not regard Totonteac and Tucano as the same cluster of towns or "kingdoms." It seems more rational to believe that they were names applied to two different groups of villages, west and northwest of Cibola, respectively, neither of which may have been the present Hopi pueblos, but both may have been inhabited by clans which later found refuge in what is now the Moqui reservation.

The old men of the Gila Indians told Garcés in 1775 that the "Moqui nation" formerly extended to the Gila, and that its people built the pueblos then in ruins in their country.[3]

Patki (Walpi and Sichumovi)

Men and boys	Women and girls
Supela	Naciumsi
Kwatcakwa	Koitsyumsi
Tcazra	Nemsi
Sakwistiwa	Nempka
Suñi	Yuña
Citaimû	Naciainima
Kwazra	Gnenapi
Makiwû	Kuᶠyû
Mowû	Tcie

[1] Letter of Don Antonio de Mendoza to Charles V, Ternaux-Compans, ser. 1, tome IX, p. 292. Ibid., Nordenskiöld's translation, p. 135.

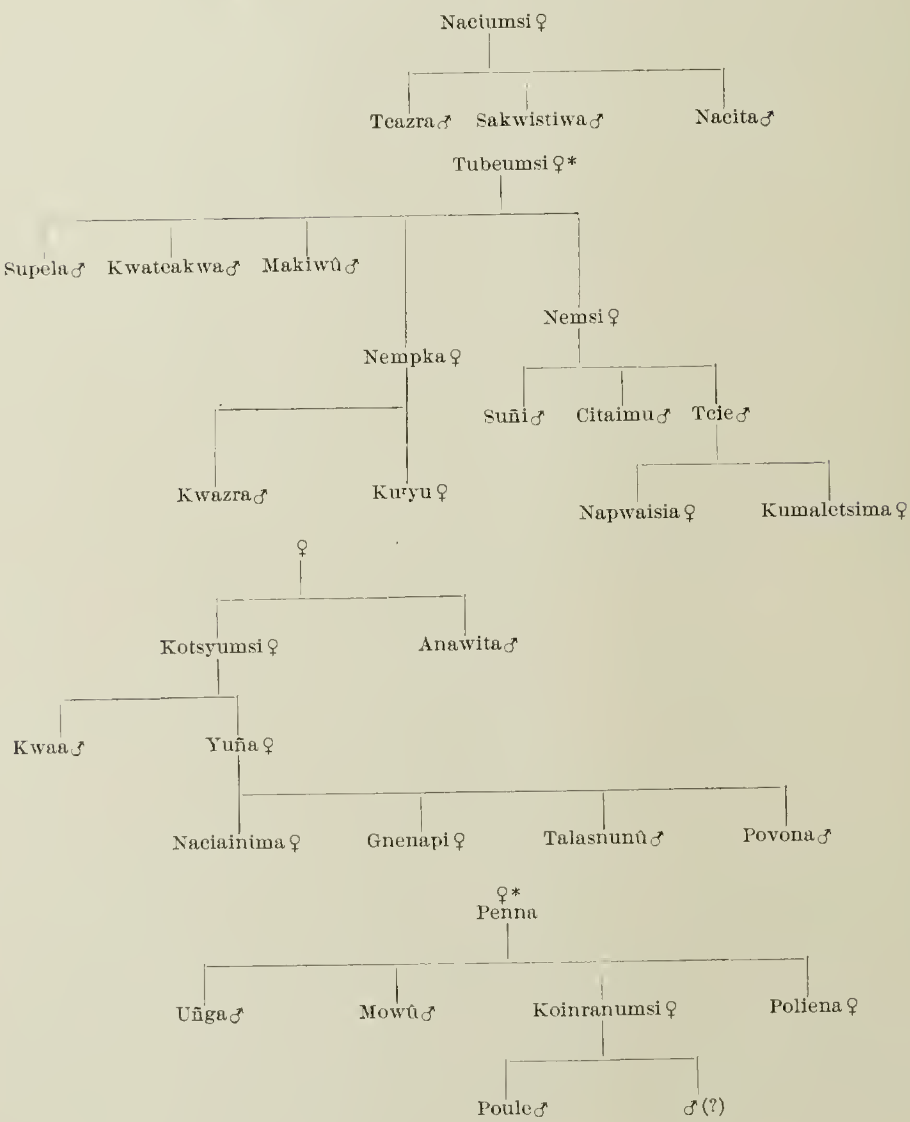
[2] Winship, Coronado Expedition, p. 562.

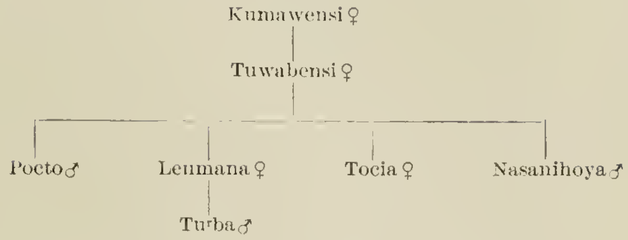
[3] "Esta enemistad me la habian contado los Indios viejos de mi Mision los Gilenôs, y Cocomaricopas por cuya noticia he discurrido quela nacion Moquis se extendia antiquamente hasta el mismo Rio Gila: fundome para esto en las Ruinas que se hallaron desde Esta Rio hasta la tierra de los Apaches, y que lo las he visto entre las sierras de la Florida," etc.—From a copy of the Diario in the Library of the Bureau of American Ethnology.

Since this paper was written a translation of the Diario, with valuable notes, by that eminent scholar, the late Dr Elliott Coues, has been published (see On the Trail of a Spanish Pioneer, the Diary and Itinerary of Francisco Garcés, New York, 1900, vol. II, p. 386).

Patki (Walpi and Sichumovi)—Continued

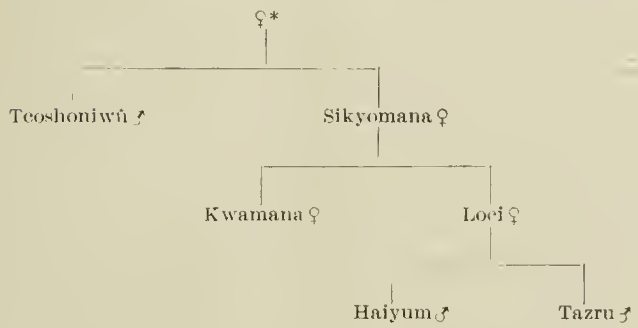
Men and boys	Women and girls
Uñga	Napwaisia
Pocto	Kumaletsima
Kwaa	Kumawensi
Nacita	Tuwabensi
Namtû	Penna
Tu^rba	Koinranumsi
Nasanihoya	Poliena
Poule	Tocia
Talasninû	Lenmana
Povona	





Several members of the Patki clan live in Sichumovi. Their names follow:

Men and boys	Women and girls
Anawita	Sikyomana
Tcoshoniwû	Kwamana
Kleā	Loci
Haiyuma	
Tazru	



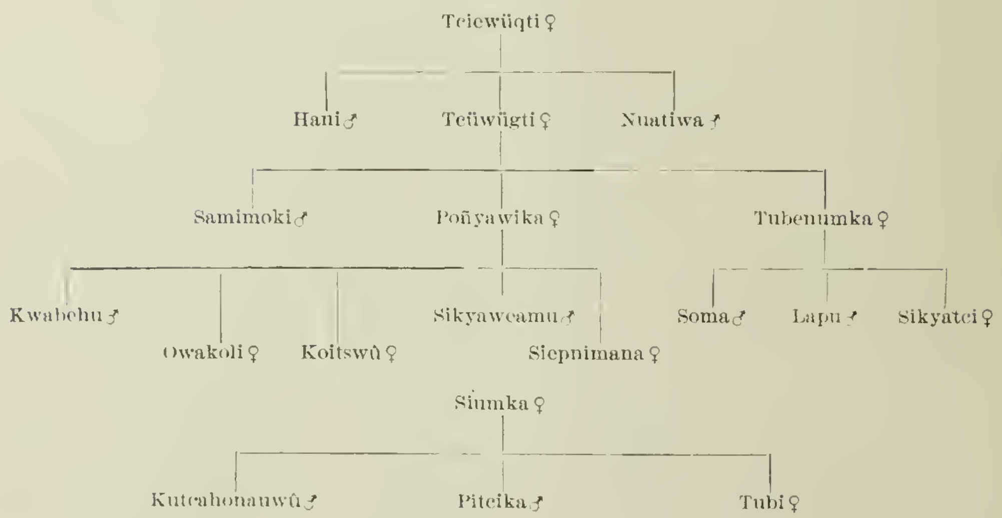
The Piba (Tobacco) and the intimately associated Tabo (Rabbit) and Sowi (Hare) clans are given a southern origin by their traditionalists. Some associate them with the Squash, others with the Water-house or Rain-cloud group, but all ascribe to them former habitations on the Little Colorado near Winslow. The ruin which now marks the site of their former home is probably that near the mouth of Chevlon fork, called Cakwabaiyaki. There is well-nigh strict uniformity in the statements that there were Piba clans in the village of Awatobi, and some say there were Piba people in the Patki settlement of Pakatcomo. The chief of the Piba clans at the former pueblo was Tapolo, who was the first Tataukyamu chief at Walpi; and Hani, who says he is a direct descendant of Tapolo,[1] is chief of the same religious society in that pueblo.

[1] Tapolo admitted the hostile Walpi into Awatobi on the night that the latter pueblo was destroyed. After the massacre he settled in Walpi.

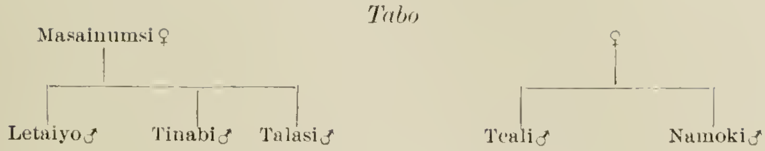
Piba-Tabo (Walpi and Sichumovi)

Men and boys	Women and girls
Hani	Tciewüqti
Talashonima	Tcüwügti
Nuatiwa	Tubenumka
Samimoki	Poñyawika
Tcali	Owakoli
Kwabehu	Koitswû
Pümû	Siepnimana
Sikyaweamu	Sikyatci
Soma	Tubi
Siskyamû	Koyoainimû
Masahoñiwû	Siumka
Tcaini	Masainumsi
Wisti	
Namoki	
Lapu	
Letaiyo	
Tinabi	
Talasi	
Tcühoya	
Lelentci	
Tüktci	
Honauwû	
Piteika	
Kuteahonauwû	
Homovi	

Piba

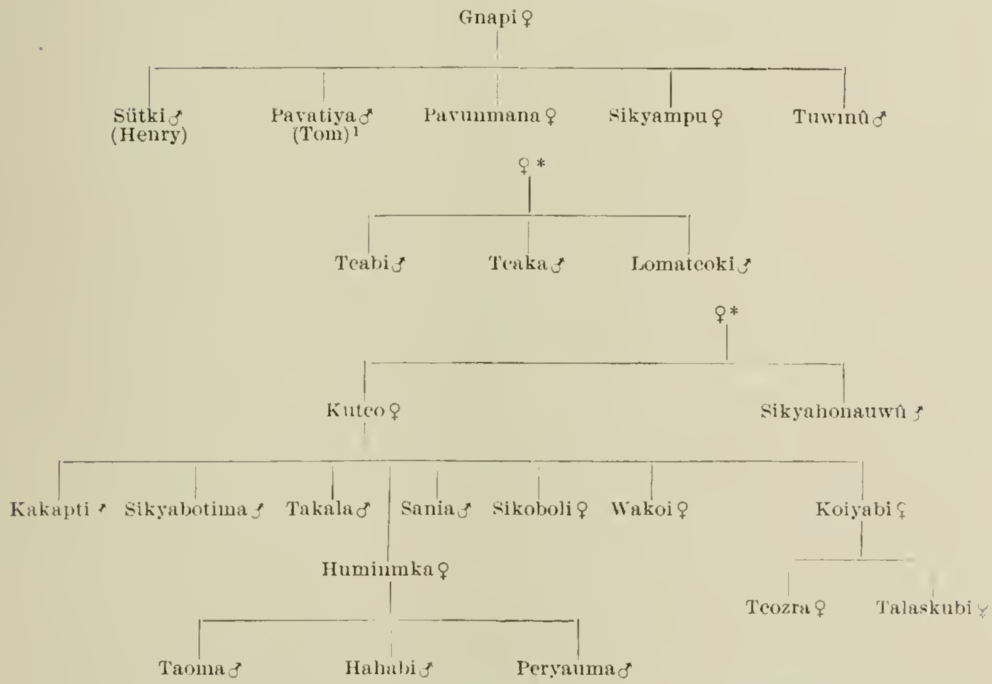


Tabo



Tüwa-Kükütc (Walpi and Sichumori)

Men and boys	Women and girls
Kakapti	Koiyabi
Sikyabotima	Gnapi
Takala	Kutco
Sikyahonauwû	Humiumka
Tcabi	Sikoboli
Tcaka	Wakoi
Sütki	Tcozra
Sania	Nakwañwuñsi
Taoma	Kerwaunainimû
Awata	Pavunmana
Peryauma	Sikyampu
Lomatcoki	Talaskubi
Tubeñima	
Lalaito	
Pavatiya	
Tuwinû	
Hahabi	



[1] Tom's mother was of the Ala clan; when she died Tom was adopted into the Tüwa.

CLANS FROM MUIOBI AND NEW MEXICAN PUEBLOS

Honau Clan

The author has been unable to gather much information regarding the early history of the Bear clan. Kotka, the chief, asserts that his people were the first to come to the Hopi country; that they formerly lived at Muiobi, the Rio Grande region, and that they "overcame" Masauñ, the ancient owner of Tusayan. The author is inclined to regard the Bear clan as one of the groups of Pueblo people from the east which migrated to Tusayan at an early date, founding a pueblo on a site assigned to it by the Kokop, with whom it lived in friendship until the advent of the Snake people; his interpretation of the "overthrow of Masauû," a tutelary god of Sikyatki, will be given later.

There are at the present time only three members of the Honau clan in Walpi: Masaiumci, the oldest woman, with her son, Kotka, the chief, and a daughter, Hoñsi, wife of Tu'noa, the Flute chief. Hoñsi has no children, and if none are born to her, the Honau clan, which was once most powerful in Walpi, will become extinct at the death of the chief and his sister.

Honau (Walpi)

Masaiumci ♀

Kotka ♂[2] Hoñsi ♀

Kokop Clans

The former home of the Kokop clans was Sikyatki, a pueblo now in ruins, about three miles north of Walpi. Archeologic evidence indicates that this pueblo was destroyed before the first contact of the Hopi with the Spaniards, and the Kokop legends declare that it was overthrown by Walpi. There was a clan in the Kokop group called the Masauñ clan, and the Snake legends recount that Masauñ formerly owned all the country, but that they, the Snake people, overcame him and received their title to the site of Walpi from him. This is believed to be a reference to the Sikyatki tragedy, and to indicate that Masauû, the God of Fire, was a tutelary god of the Kokop or Firewood people.

Katci, the chief of the surviving Kokop clans, says that his people originally came from the pueblo of Jemez or the Jemez country, and that before they lived at Sikyatki they had a pueblo in Keams canyon. Others say that they also once lived at Eighteen-mile spring, between Cotton's ranch (Pueblo Ganado) and Puñci (Keams canyon); others that they drifted at one time into the eastern part of Antelope valley, where the ruin of their pueblo can still be seen.

Archeologic investigation shows that Sikyatki was inhabited for many years, that its population was large, and that it had developed ceramic art in special lines characteristic of Tusayan ware. The technique

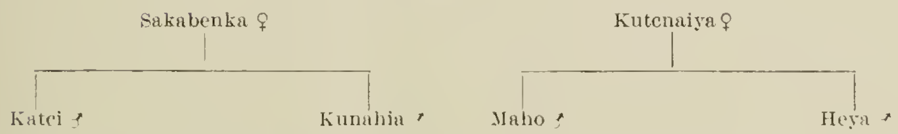
[2] Kotka really belongs to the Kokyan (Spider) clan of the Bear phratry.

and pictography of Sikyatki pottery are distinctly Hopi, showing that the makers had developed a characteristic art which could have been attained only after a long interval. The peculiarities of this pottery are not found elsewhere in the Pueblo area and are not equaled by modern Hopi potters. These conditions indicate long residence in Tusayan.

The being called Eototo has many resemblances to Masauû and may be the same being under another name. There was formerly an Eototo clan among the Kokop people, and the masks of the two personifications are very similar. In Niman-katcina, in which Eototo is personated, the Kokop chief assumes that part.

Kokop (Walpi)

Men and boys	Women and girls
Katci	Sakabenka
Maho	Kunowhuya
Kunahia	Teveyaci
Sami	Ani
Tcüa	Lekwati
Koitswinu	Hahaie
Heya	Nakwawainima
	Posiomana
	Kutcnaiya



During the last decades of the seventeenth century many clans fled from upper Rio Grande valley to the Hopi country. These were mainly Tewa people, for hardly had the Spaniards been driven out of New Mexico in 1680 than the eastern pueblos began to quarrel among themselves and, as a rule, the Tano and Tewa were worsted. A few of the former and many of the latter escaped to the province of Alaki (Horn house, Hopi country) between 1680 and 1700.

About the middle of the eighteenth century many of the descendants of these fugitives were persuaded to return, being reestablished in new pueblos. It is highly probable that the people who were thus brought back belonged to Tanoan clans, and were not true Hopi, although called "Moquis," or "Moquinos," in the accounts of that time, from the fact that they had lived in the Hopi country. In other words, they were Tewa and Tano people who had fled to Tusayan, and not original Hopi. There has been a wave of migration from the Rio Grande to the Hopi country and then a return of the same people to their former homes. No considerable number of true Hopi have

migrated to the Rio Grande and remained there, but many Tewa people who fled to Tusayan have never returned to their former homes on the Rio Grande. This is an important fact, and partially explains the existence of so many Tanoan ceremonies in the Hopi pueblos, especially of the East mesa, where Tewan influence has been the strongest. The Hano villagers are of Tanoan stock, as were probably the Asa, who were somewhat modified during their life at Zuñi.[1] No connected migration story of the Honani clans has yet been obtained, but it is said that they lived at Kienba, and brought katcinas, which are now in their special keeping. The Katcina clan is also supposed to have come from eastern pueblos, but of that no circumstantial proof can yet be given.

Honani Clans

The Honani clans once lived at Tuwanacabi, north of the Hopi pueblos, where ruins are still to be seen. They say that the Honani katcinas came up from the Underworld at that point, and that they entrusted themselves to the special keeping of these clans. The Honani migrated to Oraibi from their home at Tuwanacabi, and later some of them went to the Middle mesa, and to Awatobi and Walpi. At the time of the Awatobi massacre, in 1700, some of the Honani women were carried to Mastcomo, near the Middle mesa, where they were divided among their captors, some being taken to Mishongnovi, and others to Walpi.

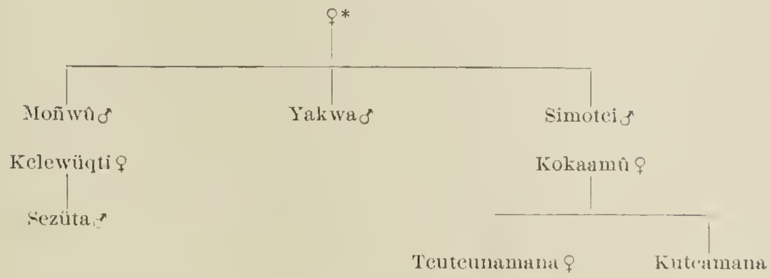
These women are not now represented by female descendants in Walpi, as all the Honani women on the East mesa are domiciled in Sichumovi.[2] Evidences drawn from the pictography of modern pottery shows that the katcinas were late arrivals at Walpi, and their association with Honani and Asa clans shows that these two groups were kindred. That the Honani claim to have the katcinas in their special keeping points the same way and supports the legends that this cult was a late addition to the preëxisting Hopi ritual.

Honani (Sichumovi)

Men and boys	Women and girls
Hozro	Kelewüqti
Moñwû	Kokaamû
Apa	Tcutcunamana
Yakwa	Kutcamana
Totci (Zuñi)	Sikyanunuma
Sinotci	
Sezüta	
Yoyowaia	

[1] There is no doubt that the Asa people lived in Zuñi, where they left some members of their clan. The descendants of these are now called Aiwahokwe.

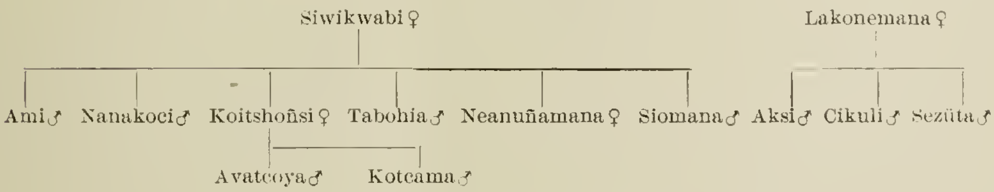
[2] The ancestors of the Honani of Sichumovi came to that pueblo from Oraibi.



The Buli or Butterfly clan is regarded as the same as the Honani or Badger. It formerly lived at Awatobi, and, although not now represented at Walpi, it is important in Sichumovi.

Buli (Sichumovi)

Men and boys	Women and girls
Ami	Siwikwabi
Aksi	Lakonemana
Cikuli	Neanuñamana
Sezüta	Siomana
Nanakoci	Siwihonima
Tabohia	Koitshoñsi
Tcoctki	
Yoyowaia	
Kotcama	
Avatcoya	

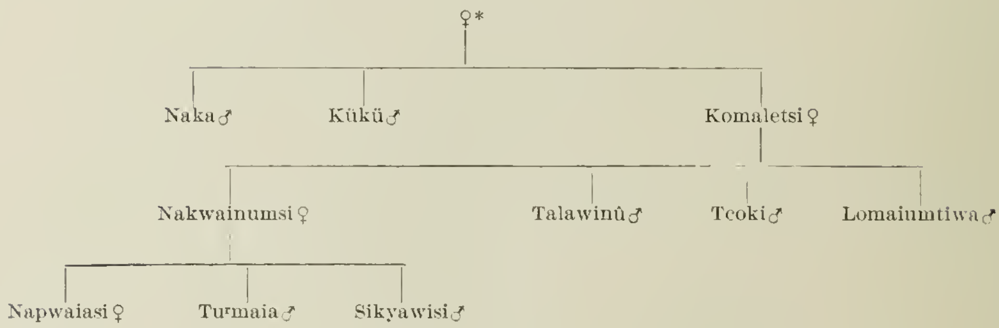


Katcina or Añwuci Clans

The Katcina or Añwuci clans were of late arrival at the East mesa, and are reported to have come from the east. The only ruins which have been identified as homes of these clans are Kicu and Wiñba, or Katcinaba, the small ruin of which is situated about 3 miles east of Sikyatki, in the foothills of the same mesa. There are at present very few people of this group at Walpi, and none at Sichumovi. Hano contains a considerable number, which would indicate that the main body went to that settlement. The abandoned houses east of the main cluster of Hano, where the site of the Katcina-kiva was pointed out by Wehe, are said to have been once inhabited by people of this group. The modern houses of the Katcina clan of Hano are on the other side of the main house cluster.

Katcina or Añwuci (Walpi)

Men and boys	Women and girls
Naka	Komaletsi
Kükü	Nakwainumsi
Lomavema	Napwaiasi
Talawinû	
Lomaiumtiwa	
Tu^{r}maia	
Sikyawisi	
Tcoki	



Pakab Clans

The legends of the Pakab clans are somewhat conflicting, but Pautiwa, of the Eagle clan, has given the most intelligible account. His ancestors, he asserts, came from the eastern pueblos, and once inhabited a village, now in ruins, called Kwavonampi. This ruin has not been identified, but was probably not far from Pueblo Ganado, and possibly may have been the same as Wukopakabi ("Great reed or arrow place"). It has been suggested that the Pakab (Arrow) was the same as the Awata (Bow) clan, which lived at Awatobi ("Place of the bow"), and additional evidence to support this suggestion is that the Bow priests came from the Bow clans. It is highly probable that the Pakab lived at Awatobi, where they were known as the Awata.

According to Stephen, on authority of Pautiwa, the Eagle clan once lived at Citaimu, now a ruin at the foot of the Middle mesa, which they abandoned, part of the inhabitants going to Walpi, others to Mishongnovi.

The affiliation of the Pakab ceremony has an important bearing on the question of clan origin. The Momtcita ceremony peculiar to the Pakab has strong resemblances to a Zuñi rite. This ceremony occurs just after the winter solstice, and although it has never been thoroughly studied,[1] the author has ample hearsay data concerning it. Pautiwa,

[1] The author witnessed the ceremony in 1900.

the Pakab chief, is also chief of a warrior society called Kalektaka, which the Hopi declare is the same as the Zuñi "Society of the Bow" (Apiʻhlaushiwani). He has a figurine of Püükoñhoya which corresponds with the Zuñi Ahaiuta, and when he sets it in place his acts are identical with those of Naiuche, the Zuñi Bow chief. On the walls of the room where it is kept there are figures of animals of the cardinal points identical with those at Zuñi, and the public dance of the Momtcita resembles the War dance at the latter pueblo.

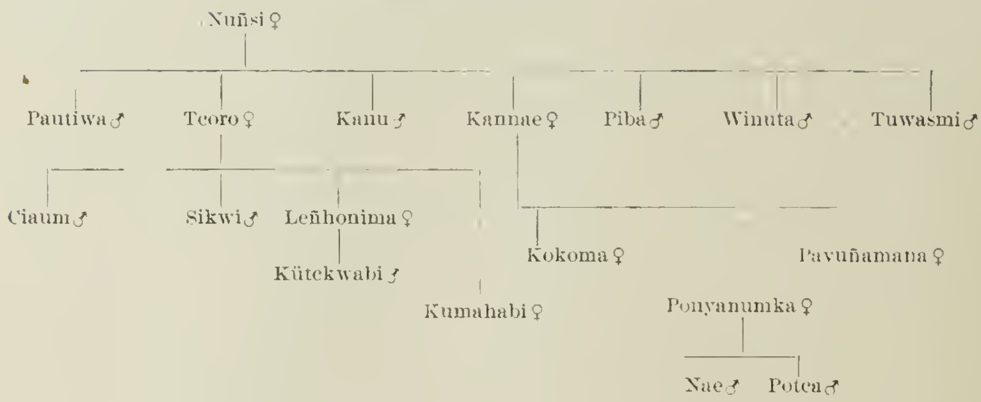
The evidence is strong enough to show that the Momtcita is closely related to the warrior celebration of the Zuñi Bow priests, and it is believed to have been derived from Zuñi, from some pueblo colony of Zuñi, or from the same source as the Zuñi variant, which means that the Pakab clans are of Zuñi origin.

The probability that the Pakab (Reed, Arrow) clans were the same as the Awata (Bow) clans makes it possible that Awatobi was settled by the Pakab people. There is nothing in the Pakab legends to forbid this, but on the other hand there is nothing definite to support it except the important statement that there were Pakab people at Awatobi. The Pakab-Awata may then be regarded as the founders of Awatobi, and if this be true there must have been close kinship between Awatobi and Zuñi, or some settlement or Pueblo whose inhabitants later went to Zuñi.

Pakab (Walpi and Sichumovi)

Men and boys	Women and girls
Pautiwa	Nuñsi [1]
Kanu	Tcoro
Piba	Kannae
Kütekwabi	Leñhonima
Nae	Kokoma
Potca	Pavuñamana
Winuta	Ponyanumka
Tuwasmi	Kumahabi
Ciaum	
Sikwi	

[1] Her arm was amputated years ago by Dr Jeremiah Sullivan (Urwici). Dr Sullivan lived for some years at Walpi, studying Hopi customs.



Asa or Tcakwaina Clans[1]

The Asa clans are said to have formerly lived at Kaëtibi, near Santa Fe (Alaviya),[2] and near Abiquiu. They are reputed to have originally been of Tewa ancestry, and to have left the Rio Grande at about the end of the sixteenth century. In their western migration they went to Tukwi (Santo Domingo) and from there to Kawaika (Laguna). From Kawaika they proceeded to Akokaiabi (Acoma), and thence to Sioki (Zuñi), where some of this clan still live, being known to the Zuñi as the Aiwakokwe clan. How long the Asa lived at the pueblo last named, and whether the Zuñi ascribe to the clan an origin in the upper Rio Grande, are unknown.

Some of the Asa continued their migration from Zuñi, proceeding to the Awatobi mesa, where they built a pueblo called Tcakwainaki ("village of the Tcakwaina clans"), near the wagon road west of the extreme end of the mesa. It is said that katcinas were then with them. They did not remain at this village a long time, but continued to the East mesa. The site of their first village at this mesa is not clearly indicated by the legends; perhaps they joined the Tewa clans, their kindred, above the spring called Isba, and it is said by some that they aided the other Tewa in their fights with the Ute. The Asa legends recount that after they had been in Tusayan for some time they built houses on the end of the East mesa above the gap (Wala), east of Hano. Years of drought resulted in a famine, and the Asa moved away to Canyon de Chelly, in the "Navaho country," where they lived in houses now in ruins. They intermarried with the Navaho, but ultimately returned to Walpi, and found that other Tewa clans occupied their former dwellings, whereupon the Walpi chief assigned them a site for a new village at the head of the "Stairway trail," if they would defend it against enemies. Their houses for the greater part are now

[1] The cult of Tcakwaina common to Zuñi and the East mesa is ascribed to this clan.
[2] Alta villa, Spanish "High town."

in ruins, although one of them, east of the Wikwaliobi-kiva, is still inhabited by an old woman of the Asa clan.

Toward the end of the eighteenth century the majority of the women of the Asa phratry moved to another point on the East mesa and founded the pueblo of Sichumovi, where their descendants still live.

The exodus of the Asa people to the Navaho country may have been about the year 1780, when Anza was governor of New Mexico. At that time we learn that the Hopi were in sore distress owing to the failure of their crops, as the legend also states, and many moved to the Navaho country, where men were killed and women "reduced to slavery." In September of the year named, Anza found that two Hopi pueblos had been abandoned and that forty families had departed.[1] As the legends declare that the Asa left at about this time for the same region, it is probable that these were the people to whom Anza refers.

It is not unlikely that the Asa and Tewa clans formed a part of the Tanoan people who were forced to leave the upper Rio Grande valley directly after the great rebellion of 1680. Niel is said to have stated[2] that at about this time 4,000 Tanos went to Tusayan by way of Zuñi, which is the trail the present Asa people say their ancestors took. We are told that they went to Alaki, and as the Ala (Horn) people were then strong at the settlements of Walpi, on the terrace of the East mesa, it is not improbable that their village was sometimes called Alaki, or "Horn pueblo." From the Hopi side we find verification of this historical event, for it is said that many people came to them from the great river just after the rebellion of 1680. The number mentioned by Niel, the statement that they went to Oraibi, and indeed all that pertains to the "kingdom founded by Trasquillo," may have been from hearsay. At all events the Asa people do not seem to have gone to Oraibi, nor are their clans now represented at this pueblo.

As bearing on the claim of Asa traditionists, the following quotation from that well-known scholar, Bandelier, has great importance:

> The modern town of Abiquiu stands almost on the site of an ancient village. The town was built in part by Genizaros or Indian captives, whom the Spaniards had rescued or purchased from their captors. The Tehuas of Santa Clara contend that most of these Genizaros came from the Moquis, and that therefore the old pueblo was called Josoge.[3]

As the Asa legends claim the site or vicinity of Abiquiu as their Rio Grande home, it would have been a natural proceeding if any of

[1] See Bancroft, Works, vol. XVII (New Mexico and Arizona), p. 186.

[2] See Bancroft, op. cit., and others.

[3] Final Report, part 2, p. 54.

them resettled there when they went back. These "Joso" (Hopi) were probably Tewa from the East mesa, and as some of the Asa returned to the Rio Grande in the middle of the eighteenth century, it would be quite natural for the Tewa to call the old pueblo on the site of Abiquiu Josoge ("Hopi pueblo").

The Asa people, like the Honani, brought some katcinas to Walpi, among which may be mentioned Tcakwaina. In the winter solstice meeting of the Asa, at which their peculiar fetishes are exhibited in the kiva, the Asa display as an heirloom an old mask called Tcakwaina, which they claim to have brought with them when they came into the country. There is a striking likeness between this mask and those of Natacka, and it is suspected that the Asa brought the Natacka to the East mesa. It is instructive to note that the Asa are not represented in the Middle mesa pueblos and Oraibi, and important light could be shed on this question if we knew that the Natacka were also unrepresented in these villages. The author suspects, on good ground, that the Oraibi have no Natacka in the Powamû ceremony.

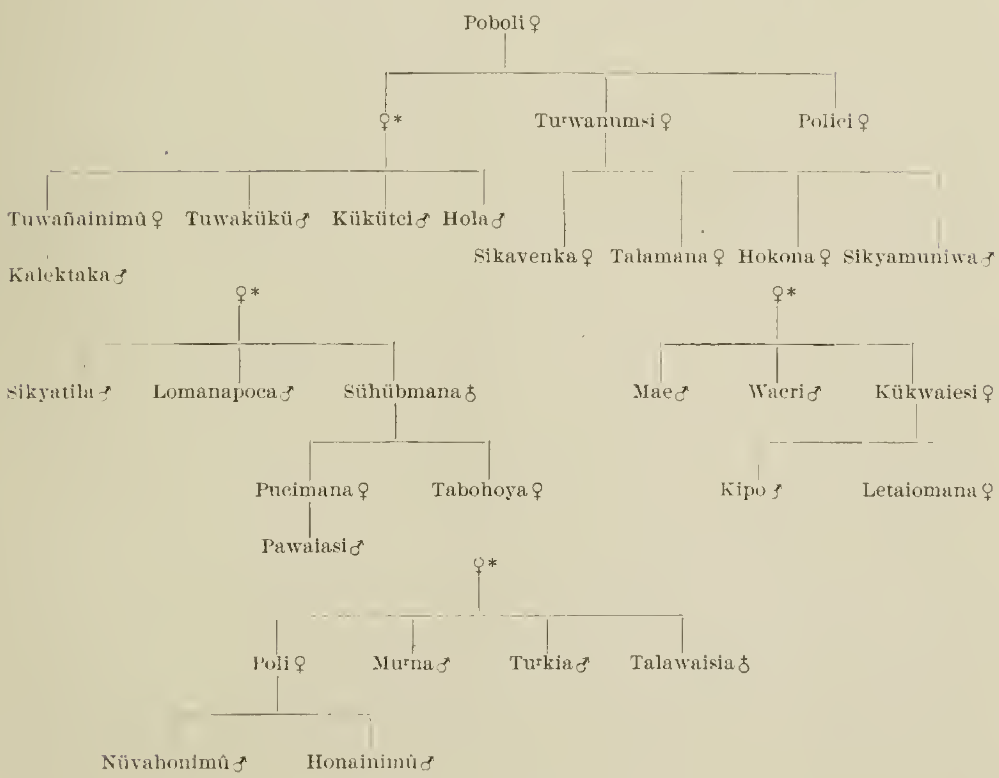
The similarity in symbolism between the masks of Tcakwaina, Natacka, and Calako taka is noteworthy, and it is not impossible that they are conceptions derived from Zuñi or some Zuñi settlement. The home of Calako was the present ruin of Winima, near St Johns, Arizona, from which place the Zuñi Calako came, according to both Hopi and Zuñi legends. The Hopi Calako is said to have come from the same place. It is likewise highly probable that the Asa introduced several other katcinas besides the Tcakwainas. Sichumovi, the present home of the Asa, is often called a Zuñi pueblo, probably because it was settled by Asa (Aiwahokwe) clans from Zuñi. This is probably the Hopi town which the Zuñis say is one of their pueblos in the Hopi country.

Asa people at Walpi

Men and boys	Women
Ametola	Wukomana
Nüvati	
Sunoitiwû	
Hauta	
Kiazru	
Hayo	
Tu^{r}kia	
Añwuci	
Talahoya (Soyoko)	
Mu^{r}na	

Asa people at Sichumovi

Men and boys	Women and girls
Hola	Tuwañainimû
Tuwakükü	Polici
Kükütci	Kükwaiesi
Mae	Letaiomana
Wacri	Poboli
Kipo	Nuva
Sikyatila	Hanoko
Lomanapoca	Talawaisia
Nüvahonimû	Sühübmana
Honainimû	Sikavenka
Sikyamuniwa	Talamana
Lomaiisba	Hokona
Turkwinamû	Tcoro
Pavashoya	Masaiunima
Kalektaka	Hewi
Taimu	Palawica
Süki	Pucimana
Poñci	Poli
	Tuʳwanumsi
	Omowû
	Pawaiasi
	Tabohoya



POPULATION OF WALPI AND SICHUMOVI BY CLANS

Walpi

Tcüa wiñwû	24
Honau wiñwû	3
Katcina wiñwû	11
Patki wiñwû	37
Pakab wiñwû	14
Kokop wiñwû	16
Asa wiñwû	11
Tüwa-Küküte wiñwû	14
Leñya wiñwû	37
Ala wiñwû	22
Piba-Tabo wiñwû	16
Total	205

Sichumovi

Asa wiñwû	40
Honani wiñwû	13
Buli wiñwû	16
Patki wiñwû	8
Tüwa-Küküte wiñwû	15
Pakab wiñwû	4
Piba-Tabo wiñwû	21
Oraibi women	2
Total	119

HANO CLANS

The present people of Hano are, in the main, descendants of Tewa clans which are said to have come to the East mesa at the invitation of the Snake chief of Walpi about the end of the decade following the destruction of Awatobi. These clans still speak the Tewa language, but, owing to intermarriage, they are more closely related consanguineally to the Hopi than to those speaking the Tewa language along the upper Rio Grande.

The traditions regarding the advent of the ancestors of the Hano people are more circumstantial than those of the other component peoples of Tusayan. The best traditionists state that the ancestors of these clans were invited by an old Snake chief, who was then the kimoñwi or pueblo chief of Walpi, to leave their home in the upper Rio Grande valley and settle in Tusayan. The Ute were at that time harrying the Hopi, and four times an embassy bearing prayer sticks was sent by the Hopi to the Tewa chief. The fourth invitation was accepted, and the Tewa clans started westward.

The original home of these clans is said to be Tcewadi, and they claim that they speak the same language as the present people of the pueblos of (1) Oʳke'; (2) Ka'po; (3) Po'kwoide; (4) Posonwû; (5) Nambe; and (6) Tetsogi. Their trail of migration is variously given. The following route is on the authority of Hatco:

Leaving Tcewadi they went to Jemesi, or Jemez, where they rested, some say, a year. From Jemesi they continued to Oʳpinp'o, called by the Hopi Pawikpa ("Duck-water"). There they rested a short time, some say, another year, then continued to Kipo, or Honaupabi (Fort Wingate). From there they went on to the present site of Fort Defiance, and after halting there a year continued to Wukopakabi (Cotton's ranch) and to Puñci (Keams canyon). Passing through Puñci,

they went on to the East mesa, where they built a pueblo on the high land near Isba, or Coyote spring. The site of their pueblo can still be seen here, and obscure house walls may be traced on the ridge of land to the left of the trail above the spring, near the rocky eminence called Sikyaowatcomo ("Yellow-rock mound").[1]

While living here they used a spring called Uñba, near the peach trees west of the mound on which the old pueblo stands. This spring is now filled with sand, and its exact position is problematic, but a spring called Isba, on the east side of the old Hano pueblo, to which reference has previously been made, is still used by the Hano people.[2]

The original Tewa clans were as follows:

Tewa	Hopi	English
Okuwañ	Patki	Rain-cloud
Sa	Piba	Tobacco
Kolon	Kae	Corn
Tenyük	Hekpai	Pine
Katcina	Katcina	———
Näñ	Tüwa	Sand
*Kopeeli	———	Pink-shell?
*Kapo'lo	Atoko	Crane
*Koyanni	Tcosbüci	Turquoise
*Täñ	Tawa	Sun
*Pe	Kokop?	Firewood?
Ke	Honau	Bear
*Tayek	———	———
*Tceta	Küküte	Bivalve-shell

*The clans whose names are preceded by an asterisk are now extinct. Legends current in Hano state that the first kimoñwi, or chief, of the pueblo belonged to the Näñ towa.

It will be noticed that several of these clans are named from the same objects from which certain Walpi clans derive their names. Thus at Hano we have Rain-cloud, Tobacco, Corn, Katcina, Sand, and Bear clans corresponding to the same at Walpi. The present village chief, Anote, belongs to the Sa (Tobacco) clan, and his predecessor, Kepo, was a member of the Kolon clan. It is reported that the first pueblo chief of the Tewa of Hano who migrated to Tusayan was

[1] The shrine of the Sun, used during the Tañtai rite, is situated to the east of this rock. In this shrine are placed, during the Soyaluña ceremony, the tawa saka paho (sun-ladder pahos), the omowû saka paho (raincloud-ladder-pahos), and several forms of nakwakwocis, or feathered strings.

[2] This spring is owned by the Hano clans, and much of the water which they use is taken from it. The cleaning out of springs when, as often happens, they are filled with drift sand is one of the few instances of communal pueblo work performed by the Hopi. As this time arrives notice is given by the town crier, by direction of the chief (kimoñwi), and all the men of the pueblo aid in the work. When Tawapa spring was cleaned out in the autumn of 1898 the male adults of Walpi worked there for three days, and the women cooked food near by, so that at the close of each day's work there was a great feast. While the work was going on a circle of the old men smoked native ceremonial tobacco in ancient pipes.

Mapibi of the Ñãñ (Sand) clan, and Potañ of the Ke (Bear) clan is said to have succeeded Mapibi. There are no Tewa women belonging to the Hano clans living in Walpi, the pueblos of the Middle mesa, or Oraibi.

The legends of their conflicts with the Ute, who were making hostile inroads upon the Hopi, have several variants, but all agree in stating that the Tewa fought with and defeated the Ute, and that the last stand of these nomads was made on the sand hill east of the mesa. Into that place the Ute had driven all the sheep which they had captured and made a rampart of their carcasses. This place now has the name Cikwituᵉkwi ("Meat mound") from that occurrence. Here the Ute were defeated and all but a few (two or four) were killed. There is an enumeration of the number above the wagon trail to Hano a short distance below the gap (Wala). The men who were saved were released and sent back to join their kindred with the word that the Tewa bears had come to Tusayan to defend it. Since this event the inroads of the Ute have ceased.

As a reward for their aid in driving back the Ute, the Tewa were given for their farms all the land north of a line drawn through Wala, the gap, across the valleys on each side of the East mesa, at right angles to the mesa; there their farms and homes in the foothills near Isba are now situated. The land holdings of the Hopi clans are south of this line, and the new houses which they have built in the foothills are on the same side.

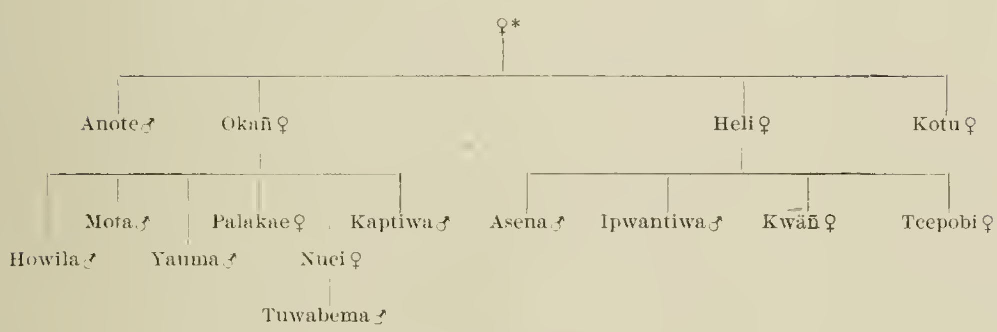
Almost all the people of Hano speak Hopi as well as Tewa, but even the Hopi men married to Hano women do not understand the language of the pueblo in which they live.

The people of Hano are among the most industrious of the inhabitants of the East mesa. Although they number only about 160, they have (in 1899) more children in the school at Keams canyon than all the other six pueblos, which number approximately 1,800 inhabitants.

Census of Hano Clans

Sa or Tobacco clan

Men and boys	Women and girls
Anote	Okañ
Asena	Heli
Ipwantiwa	Kotu
Howila	Kwäñ
Mota	Nuci
Yauma	Tcebopi
Tuwabema	Palakae
Kaptiwa	



Kolon or Corn clan

Men and boys	Women and girls
Polaka	Kotcaka
Patuñtupi	Nampio
Kano	Kwentcowû
Toto	Akontcauwû
Peke	Talikwia
Kelo	Awatcauwû
Komaletiwa	Heele
Kalaokuñ	Añtce
Tacena	Kumpipi
Oba	Pelě
Agaiyo	Kontce
Tcide	Tcaiwû
	Kweckatcañwû

- Kotcaka ♀
  - Patuñtupi ♂
  - Polaka ♂
  - Kano ♂
  - Nampio ♀
    - Kwentcowû ♀
    - Kalaokuñ ♂
    - Komaletiwa ♂
    - Akontcauwû ♀

- Talikwia ♀
  - Toto ♂
  - Peke ♂
  - Kelo ♂
  - Heele ♀
    - Agaiyo ♂
    -
      - Tcaiwû ♀
      - Kweckatcañwû ♀
      - Kontce ♀
      - Pelĕ ♀
      - Kumpipi ♀
    - Tcide ♂
    - Oba ♂
  - Awatcauwû ♀
    - Tacena ♂
    - Añtce ♀

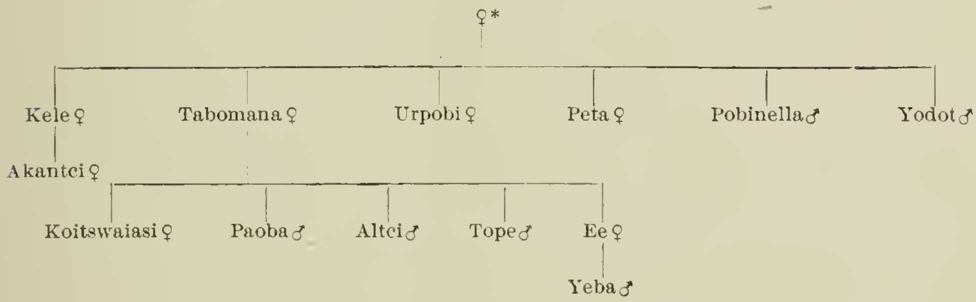
Ke or Bear clan

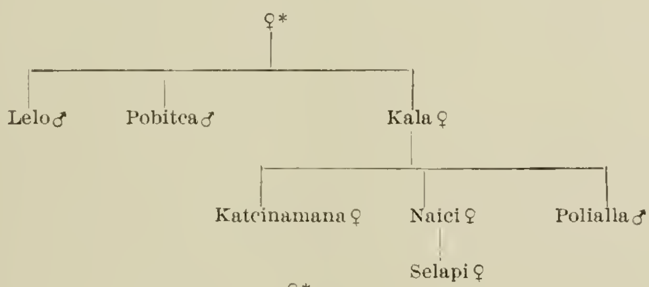
Men and boys	Women and girls
Hatco	Kauñ
Mepi	Pobi
Yoyebelli	Urbi
Palañkwaamû	Taletcañ
Yañe	Tcetcañ
Tegi	Tcepella
Cakwatotci	
Tcakwaina	

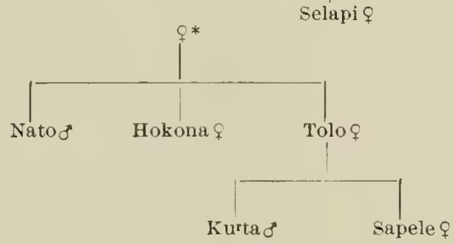
- ♀*
  - Tcakwaina ♂
  - Kauñ ♀
    - Hatco ♂
    - Tcetcañ ♀
    - Pobi ♀
      - Urbi ♀
      - Cakwatotci ♂
      - Mepi ♂
      - Taletcañ ♀
      - Tcepella ♀
      - Yoyebelli ♂
      - Palañkwaamû ♂

Tenük or Pine clan

Men and boys	Women and girls
Nato	Kala
Tae	Katcinamana
Lelo	Naici
Polialla	Selapi
Yodot	Kele
Pobitca	Akantci
Pobinella	Tabomana
Tope	Koitswaiasi
Altci	Potci
Yeba	Urpobi
Ku^{r}ta	Peta
Paoba	Ee
	Tolo
	Hokona
	Sapele

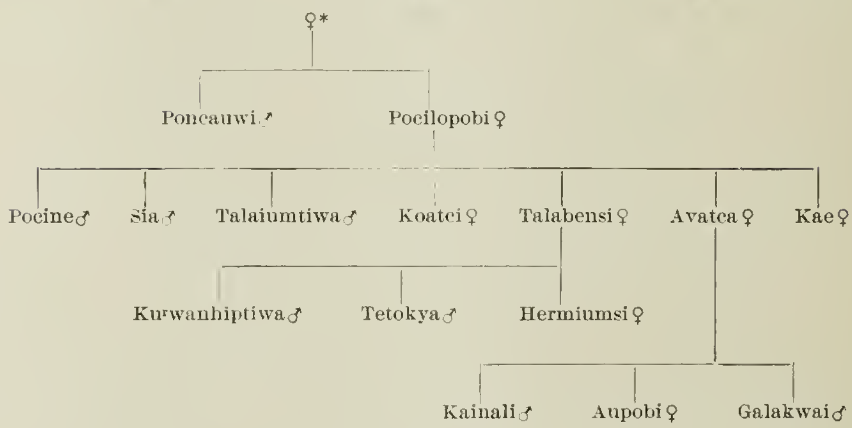






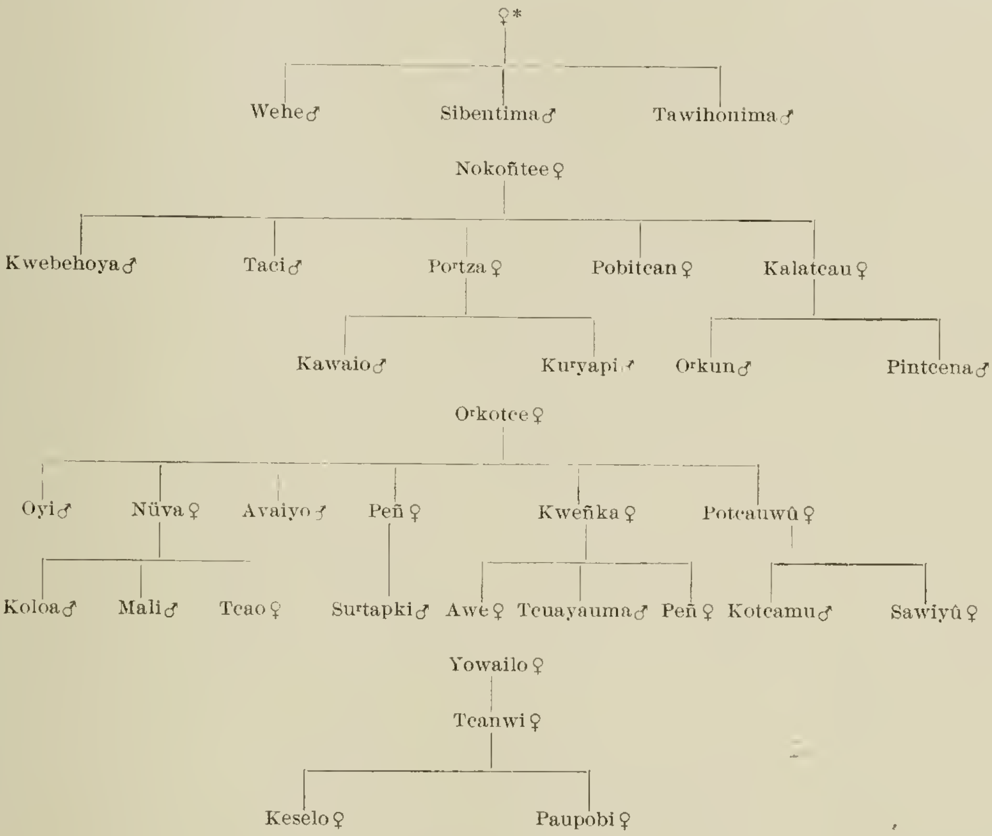
Näñ or Sand clan

Men and boys	Women and girls
Poncauwi	Pocilopobi
Pocine	Talabensi
Talaiumtiwa	Kae
Galakwai	Avatca
Kainali	Aupobi
Ku^{r}wanhiptiwa	Hermiumsi
Tetokya	Koatci
Sia	



Katcina clan

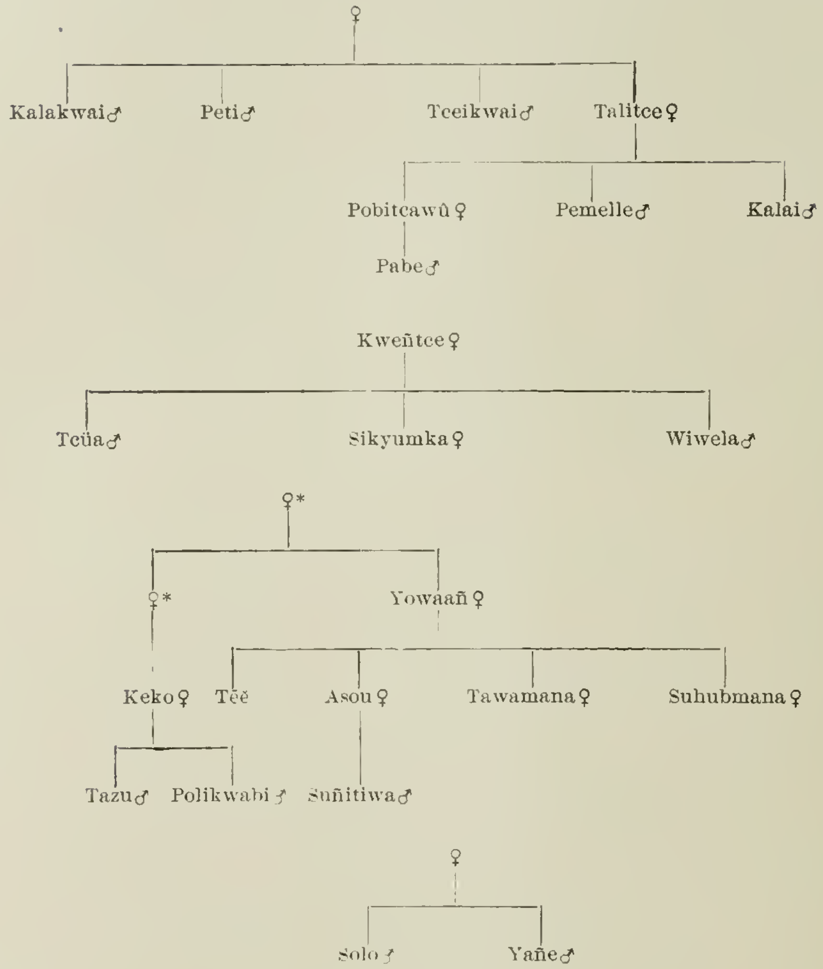
Men and boys	Women and girls
Kwebehoya	Nokoñtce
Taci	O^{r}kotce
Oyi	Kweñka
Avaiyo	Potcauwû
Wehe	Peñ
Sibentima	Peñ
Tawihonima	Sawiyû
Tcuayauma	Nüva
Koloa	Tcao
Mali	Awe
O^{r}kun	Kalatcan
Pintcena	Pobitcan
Kawaio	Po^{r}tza
Ku^{r}yapi	Yowailo
Su^{r}tapki	Tcanwi
Kotcamu	Keselo
	Paupobi



Okuwañ or Cloud clan

Men and boys	Women and girls
Kalakwai	Yowaañ
Kalai	Sikyumka
Tcüa	Saiya
Wiwela[1]	Kweñtce
Yañe	Talitce
Kelan	Pobitcawû
Solo	Asou
Pabe	Tawamana
Koktcina	Yekwi
Tceikwai	Tēĕ
Poyi	Suhubmana
Tukpa[2]	Keko[3]
Yati	
Moto[2]	
Peti	
Pemelle	
Suñitiwa	
Tazu[3]	
Polikwabi[3]	

[1] Lives at Shuñopovi. [2] Lives at Walpi. [3] Lives at Sichumovi.



Totals of Hano clans

Sa towa	15
Kolon towa	25
Ke towa	14
Tenük towa	26
Näñ towa	15
Katcina towa	32
Okuwañ towa	31
Doubtful	1
Total	159

RELIGIOUS SOCIETIES AT WALPI

The personnel of the Walpi religious societies, so far as known, is given in the accompanying lists, which may be regarded as fairly complete for the male but only approximate for the female membership. As a rule, the women members of a society may be said to be the members of the clan which introduced it, and some others. It

is not necessary to mention the names of the participants in the katcina dances, as the organization may be said to include all the men and the older boys of the pueblo. So also the names of those who participate in the Soyaluña, or Winter-solstice gathering, are not given, for, from the nature of the festival, it includes all the families in the village.

The following list includes the main religious societies in Walpi:[1]

From Tokonabi

Tcübwimpkia	Ala clans.
Tcüwimpkia	Tcüa clans.

From Palatkwabi and the Little Colorado pueblos

Kwakwantû	Patki clans.
Lalakontû	Patki clans.
Aaltû	Patuñ clans.
Wüwütcimtû	Patuñ clans.
Tataukyamû	Piba clans.
Mamzrautû	Patuñ clans.
Cakwaleñya	Leñya clans.
Macileñya	Leñya clans.

From an Eastern pueblo, Kwaranompi (derived from Zuñi?)

Kalektaka	Pakab clan.

The Katcina society, which includes all males, practices the katcina cultus, and while each performance has its own derivation, all came from eastern pueblos. In order to show whence it came to Walpi each masked personage should be mentioned in order.[2]

Katcina altars of Powamû and Niman	Katcina clans	Kicuba.
Eototo	Kokop clans	Jemez.
Sio Humis (Zuñi) and Humis	Jemez clans?	Jemez.
Calako (Sio or Zuñi)	Honani clans	Zuñi.
Tcakwaina (Natacka)	Asa clans	Zuñi.
Sio		Zuñi.
Tacab		Navaho.
Malo		Zuñi.
Pawik		Zuñi.
Aña		Zuñi.
Soyohim		Several eastern pueblos.
Kawaika		Keres pueblo?.
Kohonino		Havasupai Indians.
Hahaiwügti	Katcina	Kicuba.
Soyokmana	Honani	Keres pueblo.
Tuñwup	Honani.	
Hehea	Asa	Zuñi.

[1] This list does not include such societies as the "doctors"—the Pocwimpkias or Yayawimpkias—who are called in to cure disease, and some others.

[2] The derivation of many other katcinas will be given in a later article.

Religious Societies from Tokonabi

The Walpi clans which came from Tokonabi were, as has been shown, the Horn-Snake, and the present survivors of these components are represented by two societies of priests called Tcña-wimpkias and Tcüb-wimpkias, that is, Snake priests and Antelope priests.

These societies are regarded as the oldest in Walpi, and the ceremonies which they perform are survivals, possibly with some modifications, of a worship practiced in the former home of the Snake and Horn clans at Tokonabi. The nature of the rites at Walpi in early times may be judged from that of their modern survivals, namely, the Snake dance in August of odd years, and certain ceremonials in January of the same years.

SNAKE-ANTELOPE SOCIETIES

When Walpi was founded it contained, as has been shown, clans belonging to the Snake-Horn and the Bear groups, and probably all males older than young boys participated in their great ceremony, the Snake dance. Since that early time the advent of other families has considerably changed the social connections of the personnel of the societies, and their membership has outgrown clan limitation. The expanded societies called Snake and Antelope are now limited to no clan, but include members of all. The chief, however, and the majority of the members still come from the Snake clan, and include all its men. The extent to which the transformation of the early Snake-family worship has gone, in becoming a composite worship practiced by a dual society with a membership from all existing clans, may be seen by an enumeration of the present Snake and Antelope priests.

The existence of these two sacerdotal fraternities supports the traditionary declaration that the original people who settled on the site of Walpi included two groups of clans, the Horn and the Snake. There is also evidence in their rites that a Bear and a Puma clan were likewise represented in this early settlement, for in some of the secret ceremonies of the Snake dance we find both the bear and the puma personated.

The nature of the ceremonial calendar of the Snake-Horn people when these clans came to the East mesa and settled on the terrace under Walpi may never be known. Many rites have been dropped in the course of time, or have become so merged into others that their identity is difficult, perhaps impossible, to discover; but there are two ceremonies of the most ancient Snake-clan rites of Walpi which survive to

our day. Since the Snake dance was first celebrated in the ancient pueblo it has been somewhat modified by contact with the rituals of other clans, but even now it retains certain characteristics of a rude animal worship or zoötotemism. With modification has come a change in its purpose, so that at present it is a prayer for rain and for the growth of corn—a secondary development due mainly to an arid environment.

Membership of the Antelope Society

Individual	Clan	Individual	Clan
Wiki	Tcüa	Katci	Kokop
Wikyatiwa	Tcüa	Sami	Leñya
Hoñyi	Tcüa	Kakapti	Tüwa
Tcazra	Patki	Wewe	(?)
Kwaa	Patki	Pontima	Ala
Tcoshoniwû	Patki		

Membership of the Snake Society

Individual	Clan	Individual	Clan
Kopeli	Tcüa	Kiazru	Asa
Sikyahoniwa	Tcüa	Puryato (?)	Asa
Moumi	Tcüa	Cikuli	Buli
Nuvawinu	Tcüa	Ami	Buli
Sanna	Tcüa	Yoyowaia	Honani
Honauwû	Tcüa	Hani	Piba
Koyowaiamû	Tcüa	Sikyaweamû	Piba
Supela	Patki	Kanu	Pakab
Kwatcakwa	Patki	Piba	Pakab
Makiwû	Patki	Siskyamû	Tabo
Pocto	Patki	Homovi	Tabo
Citaimu	Patki	Lomaiumtiwa	Katcina
Nacita	Patki	Tu^{r}kwi	Leñya
Tcazra	Patki	Tcono	Ala
Talahoya	Asa	Nakava	Kokop
Lomanapoca	Asa	Sikyabotima	Tüwa
Sikyatila	Asa	Patuñtupi	Kolon
Nüvati	Asa	Kano	Kolon
Mae	Asa	Wiwela	Okuwañ

Religious Societies from Palatkwabi

The migration of clans from the south to Tusayan began very early in the history of the Hopi, and we are fortunately able to speak definitely of the movements from this direction in the seventeenth century. These were in part brought about by the inroads of a nomadic people, the Apache, who at the close of the sixteenth century began to raid the sedentary people of southern and central Arizona. Their attacks were at first weak, but gathered strength during the following century, until at the close of the year 1700 the entire central part of Arizona had passed under Apache control. The villages along the Little Colorado held out until about the close of the century, but their inhabitants were ultimately forced north to join the Hopi.

These fugitives took refuge among the Hopi in groups of clans at intervals as one after another of the southern pueblos was abandoned. The earliest group seems to have been the Patuñ, after which followed the Patki, the Piba, and others. There may have been others earlier than the Patuñ people, and possibly the Leñya was one of these, but the Patuñ clans founded some of the oldest pueblos in the Hopi country, as Mishongnovi and Tcukubi.

As Mishongnovi is mentioned in the list of Hopi towns at the end of the sixteenth century, we may assume that the advent of the Patuñ clans was prior to that date; and the fact that there were both Patuñ and Piba (Tobacco) clans in Awatobi shows that they came before the advent of the Patki people, which must have occurred shortly after Awatobi was destroyed, for no one maintains that the Patki lived at that town. They had a pueblo of their own, called Pakatcomo, 4 miles from Walpi, in which lived Patki and Tüwa or Kükute clans.

ALA-LEÑYA SOCIETIES

The Ala-Leñya clans brought a new cult to Walpi, which survives in the Flute (Leñya) observance celebrated during alternate summers. In some of the Hopi pueblos there are two sections of the Flute priesthood, called the Blue Flute and the Drab Flute, but at Walpi the latter is extinct and the ceremonies of the two are consolidated.

The existence of two divisions of Flute priests, and the fact that the Ala-Leñya group of clans is composed of two main divisions, would seem to show that the dual sacerdotal condition reflected the sociological status; that one society sprang from the Ala, the other from the Leñya components. In the present celebration of the Flute there are flute elements in both societies where they exist in dual sections.

Membership of the Flute Society[1]

Individual	Clan	Individual	Clan
Tuᶦnoa	Leñya	Kwatcakwa	Patki
Wupa	Leñya	Ametola	Asa
Moumi	Tcüa	Tcüavema (?)	Asa
Hoñyi	Tcüa	Hani	Piba
Kopeli	Tcüa	Winuta	Pakab
Supela	Patki	Sikyabotima	

[1] There are other members of this society not here mentioned.

PATUÑ-PIBA-PATKI SOCIETIES

The Patuñ (Squash) clan probably introduced into the Hopi pueblos the Aaltû, Wüwütcimtû, and Mamzrautû (a woman's priesthood) societies; the Piba (Tobacco) brought the Tataukyamû; and the Patki (Rain-cloud) brought the Kwakwantû and Lalakontû. As these clans came from the south, there are many resemblances in the rituals of their priesthoods. The names of the members of these priesthoods are given in the following lists:

Membership of the Aaltû Society

Individual	Clan	Individual	Clan
Tuwasmi	Pakab	Tcazra	Patki
Muᶦna	Asa	Pocto	Patki
Talahoya	Asa	Kwatcakwa	Patki
Hauta	Asa	Tcoshoniwû	Patki
Sikyatila	Asa	Wiwela	Okuwañ
Nüvati	Asa	Talasi	Tabo
Kiazru	Asa	Honauwû	Tabo
Simotci	Honani	Lelentci	Tabo
Yoyowaia	Honani	Letcomo	Tabo
Yakwa	Honani	Hayi	Leñya
Apa	Honani	Kükü	Katcina
Tcotcki	Buli	Tawihonima	Katcina
Sania	Tüwa	Yañe	Okuwañ.
Takala	Tüwa	Koitswinû	Kokop
Matco[1]	Tüwa	Tcüa	Kokop
Kakapti	Tüwa	Pontima	Ala
Matcuwû	Tüwa	Pema	Ala
Talanainiwû	Tüwa	Hoñyi	Tcüa
Kotka	Honau	Lomavoya	Tcüa
Mepi	Ke	Wisti	Piba

[1] Lives in Zuñi.

Membership of the Wüwütcimtû Society

Individual	Clan	Individual	Clan
Sunoitiwa	Asa	Sikyahonanwû	Tüwa
Kükütci	Asa	Pavatiya	Tüwa
Tuwakükü	Asa	Sikyabotima	Tüwa
Ametola	Asa	Potca	Pakab
Hayo	Asa	Sikyapiki[1]	Tawa
Mae	Asa	Homovi	Piba
Hola	Asa	Tcüa	Okuwañ
Kopeli	Tcüa	Tukpa	Okuwañ
Moumi	Tcüa	Makiwû	Patki
Sikyahoniwa	Tcüa	Kunahia	Kokop
Sanna	Tcüa	Katci	Kokop
Nuvaiwinû	Tcüa	Maho	Kokop
Tcaini	Tabo	Naka	Katcina
Tüktci	Tabo	Talawinû	Katcina
Sezüta	Buli	Sikyabentima	Ala
Lelo	Tenük	Honyamtiwa	Ala

[1] Lives in Shumopovi.

Membership of the Tataukyamû Society

Individual	Clan	Individual	Clan
Hani	Piba	Tu'noa	Leñya
Namoki	Piba	Sami	Leñya
Siskyamû	Piba	Pakabi	Leñya
Nuatiwa	Piba	Supela	Patki
Masahoñiwû	Piba	Kwazra	Patki
Lapu	Piba	Nanaba[1]	Patki
Ami	Buli	Nato	Tenük
Hozro	Honani	Wiki	Tcüa
Moñwû	Honani	Koyowaiamû	Tcüa
Hozro	Honani	Nae	Pakab
Sokoni	Ala	Piba	Pakab
Suhimu	Ala	Taci	Katcina
Makto	Ala	Sibentima	Katcina
Teono	Ala	Sütki	Kükütc
Maho	Kokop	Wacri	Asa
Leso	Kokop	Tu'kia	Asa
Sami	Kokop	Tcaka	Tüwa
Wikpala	Leñya		

[1] Lives in Zuñi.

Membership of the Kwakwantû Society

Individual	Clan	Individual	Clan
Anawita	Patki	Mota	Sa
Kwaa	Patki	Nuvaiwinû	Tcüa
Kleã	Patki	Wikyatiwa	Tcüa
Paca	Patki	Tenuntci	(?)
Sakwistiwa	Patki	Avaiyo	Katcina
Citaimû	Patki	Totci	Honani
Suñi	Patki	Cikuli	Buli
Veti	Okuwañ	Nanakoci	Buli
Poyi	Okuwañ	Añwuci	Asa
Klĕĕ	Okuwañ	Lomaiisba	Asa
Kelan	Okuwañ	Turkwinamû	Asa
Pitkone	Tabo	Namiñhu	Tawa
Takala	Tüwa	Namoki	Piba
Tubeñima	Kükütc	Tcali	Piba
Pütci	Ala	Letaiyo	Piba
Turkwi	Leñya	Kano	Kolon
Nitioma	Leñya		

The women's society which was introduced by the Patki people is called Lalakoñtû, and its ceremony at Walpi in 1891 was participated in by the following persons:

Membership of the Lalakoñtû Society

Women[1]	Clan	Men	Clan
Koitsyumsi	Patki	Pütci	Ala
Naciainima	Patki	Ametola	Asa
Kumawensi	Patki	Kwatcakwa	Patki
Kuryû	Patki	Supela	Patki

The author has not learned the names of all the members of the Mamzrautû society, but those of the more important participants in its 1892 performance are as follows:

[1] The list is incomplete, but it includes the chief priestesses.

Membership of the Mamzrautû Society

Women	Clan	Men	Clan
Saliko	Tcüa	Sunoitiwû	Asa
Sakabenka	Kokop	Ametola	Asa
Naciumsi	Patki	Supela	Patki
25 other women		Kwatcakwa	Patki
		Nuvawinû	Tcüa
		Wiki	Tcüa
		Hoñyi	Tcüa

The Kalektaka Society

The society of warriors called the Kalektaka was introduced by the Pakab clans, and their ceremony, the Momtcita, bears a very close likeness to that of the Priesthood of the Bow at Zuñi. From these resemblances this society is regarded as of New Mexican origin, but among the Hopi it is simply the celebration of the Pakab clans and does not dominate the rites of any society previously mentioned. It is one of many cults, and, like others, was introduced by certain definite clans and has not obtained a hold upon others. In this its relationship differs from that of the Society of the Bow in the Zuñi ritual.

KATCINA CULTS FROM NEW MEXICAN PUEBLOS

We come now to discuss a cult at Walpi which in many ways is unique, and so markedly different is it that we have no difficulty in distinguishing it from the cults already mentioned. The one feature which separates it from the others is the existence of masked personations—men wearing helmets or masks to personate supernatural beings. In its origin it is unlike any other, for it was not brought to Walpi by any one group of clans, but by several, the arrivals of which were separated by considerable periods of time, even generations. The katcina cult is therefore not homogeneous, for not only did different clans contribute to it, but these clans came from pueblos geographically remote from one another. There is no one Katcina society limited to one group of clans, but all men and boys may and do enter into the performance of katcina dances. In this heterogeneous collection of allied cults we find some introduced by the Honani, some by the Asa, some purchased or borrowed from neighboring tribes. Some of the katcina dances are worn down to a single public masked dance from which all secret rites have disappeared. Two at least, the Powamû and the Niman, are of nine days' duration.

To look for the origin of the katcinas as a whole in any one family or clan would be fruitless. We must seek the independent origin of each. But there is one source to which we can turn for the two great katcina celebrations—the Powamû and Niman—and that is the Katcina (Añwuci, Crow) clans.

Happily, however, we can find that the general direction whence all the important katcinas came was the east—the New Mexican pueblos—where the same ceremonies still survive in modified form.

Tcukuwimpkiyas

An order of priests called the Tatcuktû, or Mudheads—men wearing cloth masks with large knobs on their tops and sides—was brought to Tusayan from the New Mexican pueblos. They do not belong to the ancient Hopi ritual, but came with those clans who brought the katcinas, with whom they appear in modern ceremonies. This order is very ancient in the pueblos from which it came, as are likewise the katcinas, but they do not belong to the cults of the clans from Tokonabi or Palatkwabi.

Sumaikolis

The Sumaikoli priests and cult are closely connected with the katcinas, and are supposed to have been introduced into Tusayan from New Mexico.

THE EAST MESA RITUALS

Walpi is the only pueblo on the East mesa where a true Hopi ritual is celebrated, but it has become more profoundly affected by intrusive clans of other stocks than that of any other Hopi pueblo. This modification, due to the vicinity of Sichumovi and Hano, is particularly marked in the great katcina observance called Powamû, which differs greatly from the Oraibi performance of that name. The clans which have been of greatest importance in bringing about this modification are the Asa[1] and the Hano clans, none of which exist at Oraibi.

The Walpi Ritual

January	Pa (Winter Snake or Flute).
	Mucaiasti.
	Winter Tawa-paholawû.
February	Powamû.
	Winter Lakone-paholawû.
March	Unkwanti or Palülükoñti.
	Sumaikoli.
	Winter Marau-paholawû.

[1] The author ascribes the introduction of the Natacka at the Powamû ceremony of Walpi to the Tcakwaina or Asa clan.

April–June	Abbreviated Katcina observances.
	Niman-katcina.
July	Tawa-paholawû.
August	Snake or Flute dance in alternate years.
September	Lalakoñti.
October	Mamzrauti.
November	Wüwütcimti or Naacnaiya.
December	Soyaluña.
	Momtcita.

This ritual is practically that of the four other Hopi pueblos, in which it is repeated with some variation in details.[1]

The Sichumovi Ritual

January	Pamurti.
	Zuñi Return Katcina.
February	Powamû.
	Katcina visitors to Walpi kivas.[2]
March	Palülükonti.
April–June	Abbreviated Katcina observances.
July	Sio Calako (occasionally).
September	Bulintikibi (occasionally).
October	Owakülti (occasionally).
December	Soyaluña (contributes to Walpi celebration).

As Tewa (Asa and Honani) clans predominate in Sichumovi, katcinas largely predominate in this pueblo. The Bulintikibi is intrusive, unlike Hopi ceremonies, and almost identical with one of those still celebrated in the eastern pueblos from which the Asa came. The Sio Calako is an incorporated Zuñi observance greatly abbreviated. From a ceremonial point of view the Sichumovi ritual is closely related to that of eastern pueblos, and just those elements which it shares with the Hopi ritual are the elements which have been introduced into Walpi by clans from the same region of the pueblo area from which the Sichumovi settlers came.

The Hano Ritual

January	Abbreviated Katcina observances.[3]
February	Powamû katcina visitors to Walpi kivas.[4]
March	Palülükonti.
April–June	Abbreviated Katcina observances.
July	Tawa-paholawû (sun prayer-stick making).
August	Sumaikoli.
September–October	Howina (occasionally).
December	Tañtai (winter solstice rites).
	Warrior celebration.

[1] For bibliography of ceremonies see American Anthropologist, vol. XI, 1898.

[2] In 1892, Hahaiwügti, Natackas, Kawaika (Keresan) katcinas.

[3] In 1892, Tacab, Humis, etc., personations.

[4] In 1892, Tatcuktû (Mud-heads), Natackas, Hahaiwügti, Tcakwaina katcinas with squash blossoms in their hair.

In this ritual of Hano, which is a fragmentary survival of that at Tcewadi, the Rio Grande home of the Hano clans, the Tawa-paholawû, Sumaikoli, and Tañtai are in a way characteristic and are essentially different from those of a Hopi pueblo. The Hano celebrations in the January and February moons take the form of personations of katcinas, who visit the Walpi and Sichumovi kivas as well as their own. No katcina altar has yet been seen in this village, and there is no presentation of the Powamû, Niman-katcina, Snake or Flute, Lalakoñti, Mamzrauti, Wüwütcimti, or Momtcita in this Tewa pueblo. To the great katcina celebrations of Powamû the Hano send katcina personators, and there are certain simple rites connected with the Powamû in some of their houses and kivas, as that of Ahole elsewhere[1] described, but these are fragmentary. Both Hano and Sichumovi contribute katcina personators, who visit the Walpi kivas, and this renders the Powamû in that village different[2] from that in other Hopi pueblos.

CONCLUSIONS

The following conclusions are reached in the preceding studies:

1. The pueblo of Hano is Tanoan in language and culture; it was transplanted from the upper Rio Grande valley to the East mesa of Tusayan. Its religion is intrusive, and its ritual resembles that of Walpi only in those features which have been brought by kindred clans from the same region.

2. The religious ceremonies of Sichumovi are also intrusive from the east, because the majority of its people are descended from colonists from the same region as those who settled Hano. The Hopi language is spoken at Sichumovi, but the ritual is purely Tanoan. Thé rituals of Sichumovi and Hano are allied to those of certain New Mexican pueblos.

3. The pioneer settlers of Walpi were Snake and Bear clans, the former predominating, and the first increase was due to an addition of Horn clans which once lived at the now ruined pueblo of Tokonabi, the place from which the Snake clans also came. These Horn people were mixed with Flute clans from the Little Colorado. The majority of the clans and the most distinctive ceremonies in the Walpi ritual came from southern Arizona, and the many resemblances in the Hopi ritual to that of the eastern pueblos is due to eastern colonists who sought refuge in Walpi.

4. The conclusion that the present Hopi are descended wholly from nomadic people from the north is questioned, except within the limitations mentioned. Some parts of the ritual which are distinctly Hopi are found not to have come from the north, but from the south.

[1] Fifteenth Annual Report of the Bureau of American Ethnology.

[2] The existence of Natacka at the Walpi Powamû is due probably to Sichumovi or Hano clans, possibly to the Asa of the former pueblo.

LOCALIZATION OF TUSAYAN CLANS

BY

COSMOS MINDELEFF

ILLUSTRATIONS

PLAN OF SUMMER SETTLEMENT

LOCALIZATION OF TUSAYAN CLANS

By Cosmos Mindeleff

Of the many problems which perplex the student of the cliff ruins and other house remains of pueblo origin in the Southwest, two are of the first importance and overshadow all the others. These are (1) the enormous number of ruins scattered over the country and (2) the peculiarities of ground-plan and their meaning. The two phenomena are so intimately connected that one can not be understood or even studied without the other.

The ancient pueblo region extends from Great Salt lake to beyond the southern boundary of the United States and from the Grand canyon of the Colorado to the vegas or plains east of the Rio Grande and the Pecos. Within this area of about 150,000 square miles ruins can be numbered almost by thousands. Such maps as have been prepared to show the distribution of remains exhibit a decided clustering or grouping of ruins in certain localities. Much of this is doubtless due to the state of our knowledge rather than to the phenomena themselves; that is to say, we know more about certain regions than about others. Yet from the data now in hand it is a fair inference that ruins are generally clustered or grouped in certain localities. There were apparently a number of such centers, each the source of many subordinate settlements more or less scantily distributed over the regions between them.

This distribution of ruins lends color to a hypothesis advanced by the writer some years ago, which affords an at least plausible explanation of the immense number of ruins found in the Southwest. The key to this problem is the extended use of outlying farming settlements. All lines of evidence—history, tradition, mythology, arts, industries, habits and customs, and above all the ruins themselves—agree in establishing the wide prevalence, if not the universal use, of such settlements, as much in the olden days as in modern times, and as much now as ever.

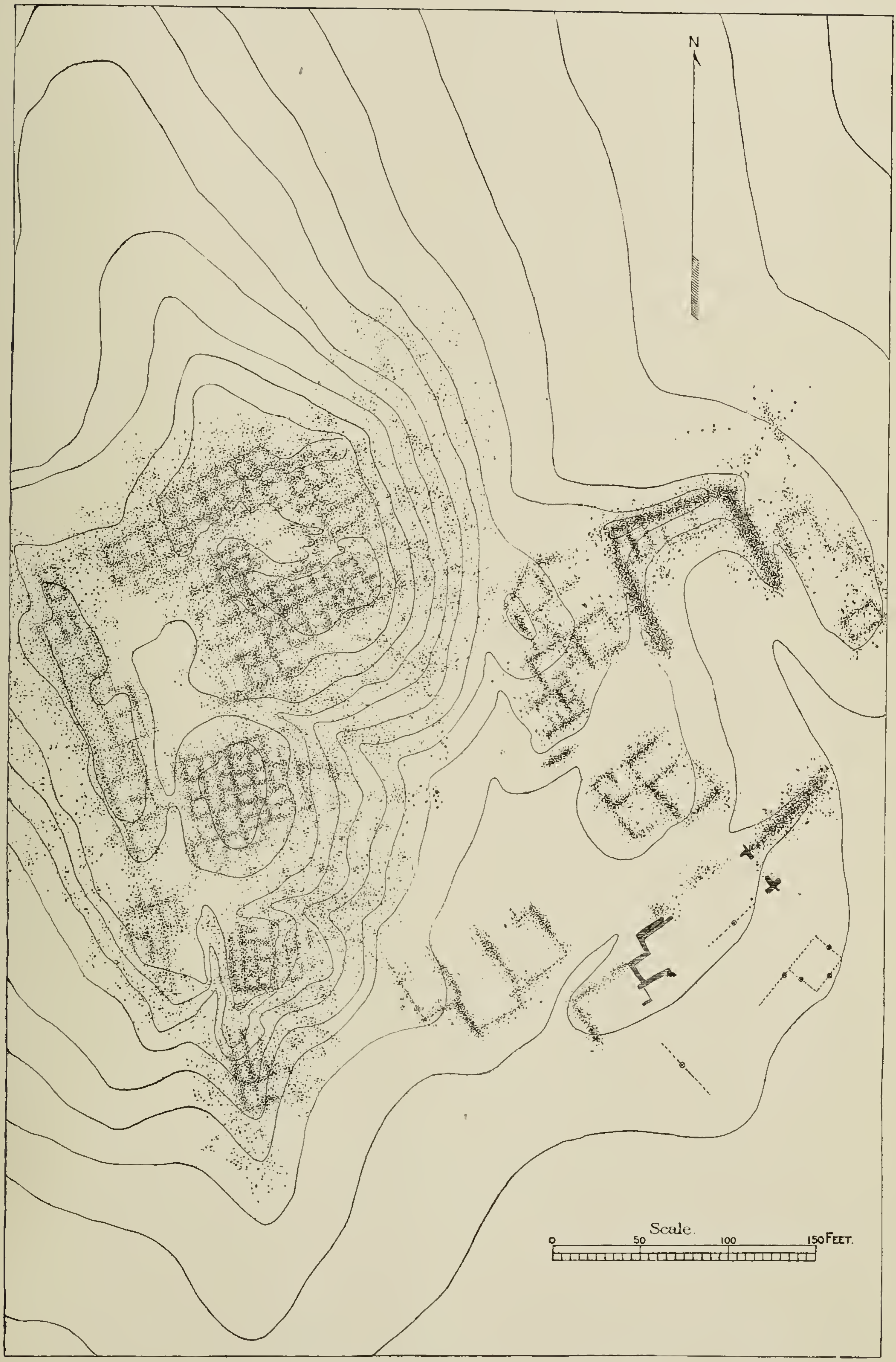
The ruins are of many kinds and varieties; no two are quite alike, but there are external resemblances which have led to several attempts

at classification. The results, however, are not satisfactory, and it is apparent that we must look further into the subject before we can devise a good classificatory scheme. It seems to the writer that all the plans of classification hitherto published have put too much stress on the external appearance of ruins and not enough on the character of the sites which they occupy or on the social and tribal conditions indicated by such sites.

Pueblo architecture is essentially a product of the plateau country, and its bounds are, in fact, practically coincident with those of that peculiar region popularly known as the mesa country. Peculiar geological conditions have produced a peculiar topography, which in turn has acted on the human inhabitants of the country and produced that characteristic and distinctive phase of culture which we call pueblo art. The region is in itself not favorable to development; in three essentials, cultivable land, water, and vegetation, it is anything but an ideal country, although blessed with an ideal climate which has done much to counteract the unfavorable features. But through a great abundance of excellent building material, the product of the mesas, and through peculiar social conditions, the product of the peculiar environment, whereby a frequent use of such materials was compelled, pueblo architecture developed.

It seems probable that in the early stages of the art of house building among these people they lived in small settlements located in or near the fields which they cultivated, for the pueblo tribes have always been an agricultural people, living principally by the products of the soil. In the olden days, before the introduction of sheep and cattle, they were even more agricultural than they are now, although at that time they had a food resource in their hunting grounds which is now lost to them. It seems probable that for several centuries the people pursued the even, placid course of existence which comes from the undisturbed cultivation of the ground, with perhaps now and then some internecine war or bloody foray to keep alive their stronger passions.

In the course of time, however, other tribes drifted into the region, and, being wild and accustomed to the hardy life of warriors, they soon found that they were more than a match for the sedentary tribes which had preceded them. The latter were industrious, and, being more or less attached to certain localities, were enabled to lay by stores against a possible failure of crops. At the present day in some of the pueblos the corn is thus stored, and sometimes great rooms full of it can be seen, containing the full crops of one or two years. Undoubtedly the same custom of storing food prevailed in ancient times, and the wilder tribes found in the sedentary villages and in the fields tributary to them convenient storehouses from which to draw their own supplies. If the traditions are at all to be trusted, there was no open war nor were there determined sieges, but foray after foray was made by the



PLAN OF RUIN SHOWING LONG OCCUPANCY

wilder spirits of the nomadic tribes; fields were raided when ripe for the harvest, and the fruit of a season's labor was often swept away in a night. It soon became unsafe to leave the village unguarded, as a descent might be made upon it at any time when the men were away, and the stores accumulated for the winter might be carried off. But the detail of a number of men to guard the home was in itself a great hardship when men were few and subsistence difficult to obtain. Such were the conditions according to the ancient traditions.

Under the pressure described the little villages or individual houses, located primarily with reference to the fields under cultivation, were gradually forced to aggregate into larger villages, and, as the forays of their wild neighbors continued and even increased, these villages were moved to sites which afforded better facilities for defense. But through it all the main requirement of the pueblo builder—convenience to and command of agricultural land—was not lost sight of, and the villages were always located so as to meet these requirements. Generally they were placed on outlying spurs or foothills overlooking little valleys, and it should be noted that at the time of the Spanish discovery and conquest, three centuries and a half ago, a considerable number of the villages were so located.

There seems to be little doubt that the first troubles of the pueblo builders, aside from those arising among themselves, which were not sufficiently important to influence their arts or architecture, were caused by the advent of some tribe or tribes of Athapascan stock. Afterward, and perhaps as late as the beginning of the eighteenth century, the Comanche extended their range into the pueblo country, and still later the Ute found profit in occasional raids over the northern border. It is quite probable, however, that in the beginning, when pueblo architecture was still in an early stage of development, none of the tribes mentioned were known in that country.

Eventually the housebuilders found it necessary to remove their homes to still more inaccessible and still more easily defended sites, and it was at this period that many of the mesas were occupied for the first time. The country is practically composed of mesas, and it was an easy matter to find a projecting tongue or promontory where a village could be built that would be accessible from one side only, or perhaps would be surrounded by cliffs and steep slopes that could be sealed only after a long and arduous climb over a tortuous and difficult trail. Building material was everywhere abundant and could generally be found within a stone's throw of almost any site selected.

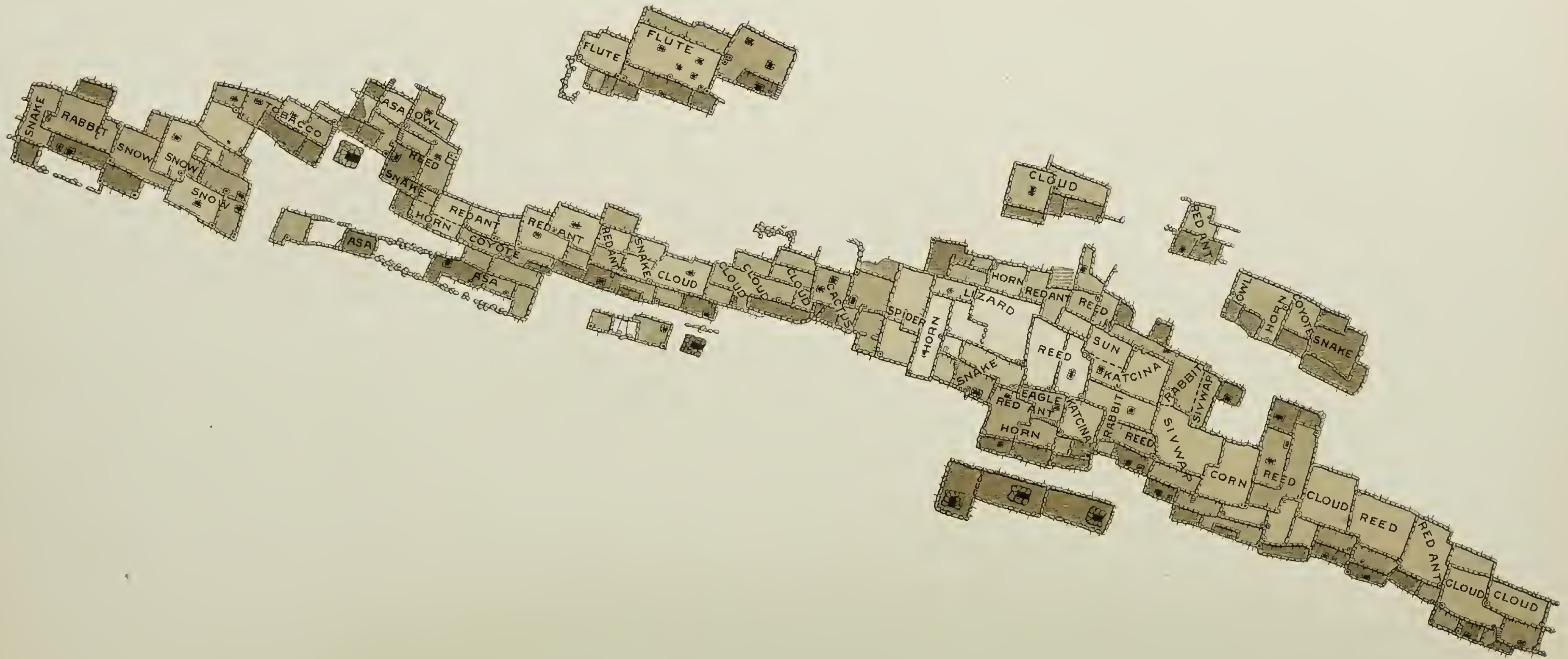
Few of the villages at the time of the Spanish conquest were located on mesa sites, but numbers of them were on the foothills of mesas and sometimes commanded by higher ground. At that time Acoma occupied its present location on the mesa summit, one of the best if not the best and most easily defended in New Mexico, as the

Spaniards found to their cost after an unsuccessful assault. But this location was at that time unusual, and was doubtless due to the fact that the people of Acoma were, like the wilder tribes, predatory in their instincts and habits, and lived upon their neighbors.

When the little settlements of the first stage of development were compelled to cluster into villages for better protection, a new element came into pueblo architecture. The country is an arid one, and but a small percentage of the ground can be cultivated. Except in the valleys of the so-called rivers, arable land is found only in small patches here and there—little sheltered nooks in the mesas, or bits of bottom land formed of rich alluvium in the canyons. Easily defended sites for villages could be found everywhere throughout the country, but to find such a site which at the same time commanded an extensive area of good land was a difficult matter. It must be borne in mind that the pueblo tribes in ancient times, as now, were first and foremost agriculturists, or rather horticulturists, for they were not farmers but gardeners. Depending as they did upon the products of the soil, their first care was necessarily to secure arable lands. This was always the dominating requirement, and as it came in conflict with the clustering of houses into villages, some means had to be devised to bring the two requirements into accord. This was accomplished by the use of farming shelters, temporary establishments occupied only during the farming season and abandoned on the approach of winter, but located directly on or overlooking the fields under cultivation.

The ultimate development of pueblo architecture finds expression in the great clustered houses which remind one of a huge beehive. As the wilder tribes continued their depredations among the inoffensive villagers, and, with the passing of time, grew more numerous and more and more bold in their attacks and forays, the pueblo tribes were forced to combine more and more for protection. Groups of related villages, each offering a point of attack for savage foes and rich plunder when looted, were compelled to combine into a single larger pueblo, and as reliance was now placed on the size of the village and the number of its inhabitants, these large villages were located in wide valleys or on fertile bottom lands, the people again returning to their original desire to live upon the lands they worked.

Under modern conditions, when the depredations of the wild tribes have been terminated by the interference of a higher and stronger civilization, the houses are reverting to the primitive type from which the great pueblos developed. But so late as ten or twelve years ago the Hopi or Tusayan villages were under the old conditions and were subjected to periodical forays from their immediate neighbors, the Navaho. Young warriors of the latter tribe ravaged the fields of the Hopi, more perhaps for the pleasure it afforded them and on account of the old traditions than from any real necessity for food as they destroyed more



PLAN OF WALPI SHOWING DISTRIBUTION OF CLANS

than they took away. If they found anyone in the fields, they would beat him, or perhaps kill him, merely for the amusement it seemed to afford. It was the Navaho method of "sowing wild oats." There is little doubt that the pressure which bore on the Pueblos for at least some centuries was of this nature, annoying rather than actually dangerous. No doubt there were also occasional invasions of the country of more than usual magnitude, when from various causes the nomadic tribes had either an abundance or a scarcity of food, and, knowing the character of the villages as storehouses of corn and other products, or impelled by old grudges growing out of former forays, a whole tribe might take part in the incursion, and perhaps try themselves by an assault on some village of considerable size. But such expeditions were rare; the pueblo tribes were annoyed rather than menaced. Eventually, however, they found it necessary to provide against the ever-present contingency of an invasion of their country, and the great valley pueblos were developed.

As aggregation of the little settlements into villages and of villages into great valley pueblos continued, the use of farming shelters grew apace. No matter what the conditions might be, the crops must be grown and harvested, for the failure of the crops meant the utter annihilation of the people. They had no other resource. They were compelled to combine into large pueblos containing often a thousand or fifteen hundred souls, a condition which was at variance with their requirements and manner of life; but they were also compelled to till the soil or starve. The lands about the home villages were never sufficient for the needs of the people, and in consequence a considerable portion of the population was compelled to work fields more or less distant from them. Thus, in the ultimate stage of pueblo development the use of farming shelters was as much or more in evidence, and as much a necessity to the people, as in the prior stages.

This sketch of the development of pueblo architecture exhibits a sequence; but it is a cultural, not a chronologic, one. The data in hand will not permit the determination of the latter now, but within a given group sequence in culture and sequence in time are practically synonymous. The time relations of the various groups, one to another, must be determined from other evidence.

The use of farming shelters has been a most important factor in producing the thousands of ruins which dot the mesas and canyons of the Southwest, while another factor, the localization of clans, has worked with it and directed it, as it were, in certain channels. All the evidence which investigation has revealed, from traditions to the intrinsic evidence of the ruins themselves, concur in establishing the fact that the pueblo tribes were in slow but essentially constant movement; that movement has continued down to the present time and is even now in progress. Viewed across long periods of time it might

be regarded as a migration, but the term has not the same meaning here that it has when applied to the movements of great masses of humanity which have taken place in Europe and Asia. In the pueblo country migration was almost an individual movement; it was hardly a tribal, certainly not a national, exodus. Outlying farming settlements were established in connection with each important village. In the course of time it might come about that some of the people who used these establishments at first only during the summer, retiring to the home village during the winter, would find it more convenient to remain there throughout the year. At the present day some of the summer villages are fifteen miles and more from the home pueblo, and it must have been at best inconvenient to live in two places so far apart.

The home villages can be distinguished from the summer places by the presence or absence of the kivas, or sacred ceremonial chambers. For as practically all the rites and dances take place after the harvest is gathered and before planting time in the spring—that is, at the season when the men have some leisure—they are performed in the home pueblos, and only such villages have kivas.

When, from prolonged peace or for other reasons, some families allowed the inconvenience of moving back and forth to dominate over counter motives, and remained throughout the year at the summer place, they might build a kiva or two, and gradually, as others also decided to remain, the summer place would become a home village. As the population grew by increment from outside and by natural increase this village would put out farming shelters of its own, which in the course of time might supplant their parent in the same way. The process is a continuous one and is in progress to-day. The summer village of Ojo Caliente, 15 miles from Zuñi, and attached to that pueblo, has within the last decade become a home village, occupied throughout the year by several families, and during the farming season by many others. Eventually kivas will be built there, if this has not already been done, and Ojo Caliente will become a real home village and put out farming shelters of its own. Such is also the case with the pueblo of Laguna, which is gradually being abandoned by its inhabitants, who are making their permanent homes at what were formerly only summer villages.

It will thus be seen that a comparatively small band might in the course of a few centuries leave behind them the remains of many villages. In the neighborhood of the Hopi towns there are at least 50 ruins, all, or practically all, of which were left by the people who found their present resting places on the summits of the rocky mesas of Tusayan. And with it all it is not necessary to assume great periods of time; it is doubtful whether any of the ruins of Tusayan are much more than four hundred years old, and some of them were partly

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PLAN OF SICHUMOVI SHOWING DISTRIBUTION OF CLANS

inhabited so late as fifty years ago. Including the present location, three sites of Walpi, one of the Hopi towns, are visible from the summit of the mesa. According to the native traditions the last movement of this village, only completed in the present century, was commenced when the Spaniards were in control, over two centuries ago. It is said that the movement was brought about by the women of the village, who took their children and household goods up on the summit of the mesa, where a few outlooks had been built, and left the men to follow them or remain where they were. The men followed.

Among the inhabited villages the home pueblo can be distinguished from the summer establishments by the presence of the kivas, and often the same distinction can be drawn in the case of ruins. In many of the latter the kivas are circular and are easily found even when much broken down. Aside from this the plans of the two classes of villages can often be distinguished from each other through their general character, the result of the localization of clans previously alluded to.

The migratory movements of a band of village builders often consumed many years or many decades. During this time subordinate settlements were put out all along the line as occasion or necessity demanded, and were eventually abandoned as the majority of the people moved onward. Hopi traditions tell of such movements and rests, when the people remained for many plantings in one place and then continued on. As a rule there was no definite plan to such a movement and no intention of going to any place or in any direction; the people simply drifted across the country much as cattle drift before a storm. They did not go back because they knew what was back of them, but they went forward in any direction without thought of where they were going, or even that they were going at all. It was a little trickling stream of humanity, or rather many such streams, like little rivulets after a rain storm, moving here and there as the occurrence of areas of cultivable land dictated, sometimes combining, then separating, but finally collecting to form the pueblo groups as we now know them.

There is no doubt that in addition to this unconscious drifting migration there were also more important movements, when whole villages changed their location at one time. Such changes are mentioned in the traditions and evidenced in the ruins. There is a multiplicity of causes which bring about such movements, many of them very trivial, to our way of thinking. While the climate of the pueblo country is remarkably equable and the water supply, although scanty, is practically constant over the whole region, local changes often occur; springs fail at one place and burst out at another; some seasons are marked by comparatively abundant rains, others by severe droughts. The failure of some particularly venerated spring would

be deemed good cause for the abandonment of a village situated near it, or the occurrence of several years of drought in succession would be construed as a mark of disfavor of the gods, and would be followed by a movement of the people from the village. Even a series of bad dreams which might be inflicted on some prominent medicine-man by overindulgence in certain articles of food would be regarded as omens indicating a necessity for a change of location. Such instances are not unknown. Toothache also is dreaded for mythic reasons, and is construed as a sign of disfavor of the gods; so that many a village has been abandoned simply because some prominent medicine-man was in need of the services of a dentist. Many other reasons might be stated, but these will suffice to show upon what slight and often trivial grounds great villages of stone houses, the result of much labor and the picture of permanence, are sometimes abandoned in a day.

But while such movements en masse are not unknown, they have been comparatively rare. The main movement of the people, which was a constant one, was accomplished through the custom of using outlying farming settlements. Such settlements were commonly single houses, but where the conditions permitted and the area of cultivable land justified it, the houses were grouped into villages. These were always located on or immediately adjacent to the land which was worked, and in some instances attained considerable size, but as a rule they were small. The practice was universal throughout the length and breadth of the pueblo country, and the farming shelters took various forms as the immediate topographic environment dictated. Even the cliff ruins are believed to be farm shelters of a type due to peculiar physical conditions, but as this idea has been exploited elsewhere[1] by the writer it need not be developed here.

The occupancy of farm shelters, whether individual rooms or small villages, was necessarily more or less temporary in character, and as the population moved onward the places would be finally and completely abandoned. It would often be difficult to obtain from the study of the ground-plan of a ruin, generally all that is left of it, any idea of the people who inhabited it and of the conditions under which they lived; but there is another element by the aid of which the length of time during which the village was inhabited and of the conditions under which such occupancy continued may often be approximated. This is the localization of clans, to which allusion has been made.

The constant movement of the tribe, due to the use of outlying farming settlements, which has been sketched above, has its analogue within each village, where there is an equally constant movement from house to house and from row to row. The clans which inhabit a village are combined into larger units or groups known as phratries; locally such

[1] The Cliff Ruins of Canyon de Chelly, in the Sixteenth Annual Report of the Bureau of American Ethnology.

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PLAN OF HANO SHOWING DISTRIBUTION OF CLANS

clans are said to "belong together." In the olden days each phratry occupied its own quarters in the village, its own cluster or row, as the case might be, and while the custom is now much broken down, just how far it has ceased to exercise its influence is yet to be determined.

In the pueblo social system descent and inheritance are in the female line. This custom is widely distributed among the tribes of mankind all over the world and has an obvious basis. Among the Pueblos it works in a peculiar manner. Under the old rule, when a man marries, not having any house of his own, he goes to his wife's home and is adopted into her clan. The children also belong to the mother and are members of her clan. In many of the villages at the present day a man may marry any woman who will marry him, but in former times marriage within the clan, and sometimes within the phratry, was rigidly prohibited. Thus it happened that a clan in which there were many girls would grow and increase in importance, while one in which the children were all boys would become extinct.

There was thus a constant ebb and flow of population within each clan and consequently in the home or houses of each clan. The clans themselves were not fixed units; new ones were born and old ones died, as children of one sex or the other predominated. The creation of clans was a continuous process. Thus, in the Corn clan of Tusayan, under favorable conditions there grew up subclans claiming connection with the root, stem, leaves, blossom, pollen, etc. In time the relations of clans and subclans became extremely complex; hence the aggregation into larger units or phratries. The clan is a great artificial family, and when it comprises many girls it must necessarily grow. Such is also the case with the individual family, for as the men who are adopted into it by marriage take up their quarters in the family home and children are born to them more space is required. But additional rooms, which are still the family property, must be built in the family quarter, and by a long-established rule they must be built adjoining and connected with those already occupied. Therefore in each village there are constant changes in the plan; new rooms are added here, old rooms abandoned there. It is in miniature a duplication of the process previously sketched as due to the use of outlying shelters. It is not unusual to find in an inhabited village a number of rooms under construction, while within a few steps or perhaps in the same row there are rooms vacant and going to decay. Many visitors to Tusayan, noticing such vacant and abandoned rooms, have stated that the population was diminishing, but the inference was not sound.

On the other hand, the addition of rooms does not necessarily mean growth in population. New rooms might be added year after year when the population was actually diminishing; such has been the case in a number of the villages. But the way in which rooms are added may suggest something of the conditions of life at the time of building.

The addition of rooms on the ground floor, and the consequent extension of the ground plan of a house cluster, indicates different conditions from those which must have prevailed when the village, without extending its bounds, grew more and more compact by the addition of small rooms in the upper stories.

The traditions collected from the Hopi by the late A. M. Stephen, part of which have been published,[1] present a vivid picture of the conditions under which the people lived. The ancestors of the present inhabitants of the villages reached Tusayan in little bands at various times and from various directions. Their migrations occupied very many years, although there were a few movements in which the people came all together from some distant point. Related clans commonly built together, the newcomers seeking and usually obtaining permission to build with their kindred; thus clusters of rooms were formed, each inhabited by a clan or a phratry. As occupancy continued over long periods, these clusters became more or less joined together, and the lines of division on the ground became more or less obliterated in cases, but the actual division of the people remained the same and the quarters were just as much separated and divided to those who knew where the lines fell. But as a rule the separation of the clusters is apparent to everyone; it can nearly always be traced in the ground plans of ruins, and even in the great valley pueblos, which were probably inhabited continuously for several centuries, the principal divisions may still be made out. In the simpler plans the clusters are usually well separated, and the irregularities of the plan indicate with a fair degree of clearness the approximate length of time during which the site was occupied.

A plan of this character is reproduced in figure 3, showing a ruin near Moenkapi, a farming settlement of the people of Oraibi situated about 45 miles from that village. There were altogether 21 rooms, disposed in three rows so as to partially inclose three sides of an open space or court. The rows are divided into four distinct clusters, with a single room outside, forming a total of five locations in a village which housed at most twenty-five or thirty persons. The continuity of the wall lines and comparative regularity of the rooms within each cluster, the uniformity in height of the rooms, which, if the débris upon the ground may be accepted as a criterion, was one story, and the general uniformity in the character of the masonry, all suggest that the site was occupied a short time only. This suggestion is aided by the almost complete absence of pottery fragments. It is a safe inference that persons of at least five different clans occupied this site.

A plan of interest in connection with the last is that shown in plate XXI, which illustrates the modern village of Moenkapi, occupied only during the summer. Here we have two main clusters and two

[1] A Study of Pueblo Architecture, in the Eighth Annual Report of the Bureau of Ethnology.

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PLAN OF MISHONGNOVI SHOWING DISTRIBUTION OF CLANS

detached houses, but the clusters are not nearly so regular as in the plan above, nor are the wall lines continuous to the same extent. This place is spoken of by the people of Oraibi as of recent establishment, but it has certainly been occupied for a much longer period than was the ruin near it. It is apparent from an inspection of the plan that the clusters were formed by the addition of room after room as year by year more people used the place in summer. It will be noticed that the rooms constituting the upper right-hand corner of the larger cluster on the map, while distinct from the other rooms, are still attached to them, while two other rooms in the immediate vicinity

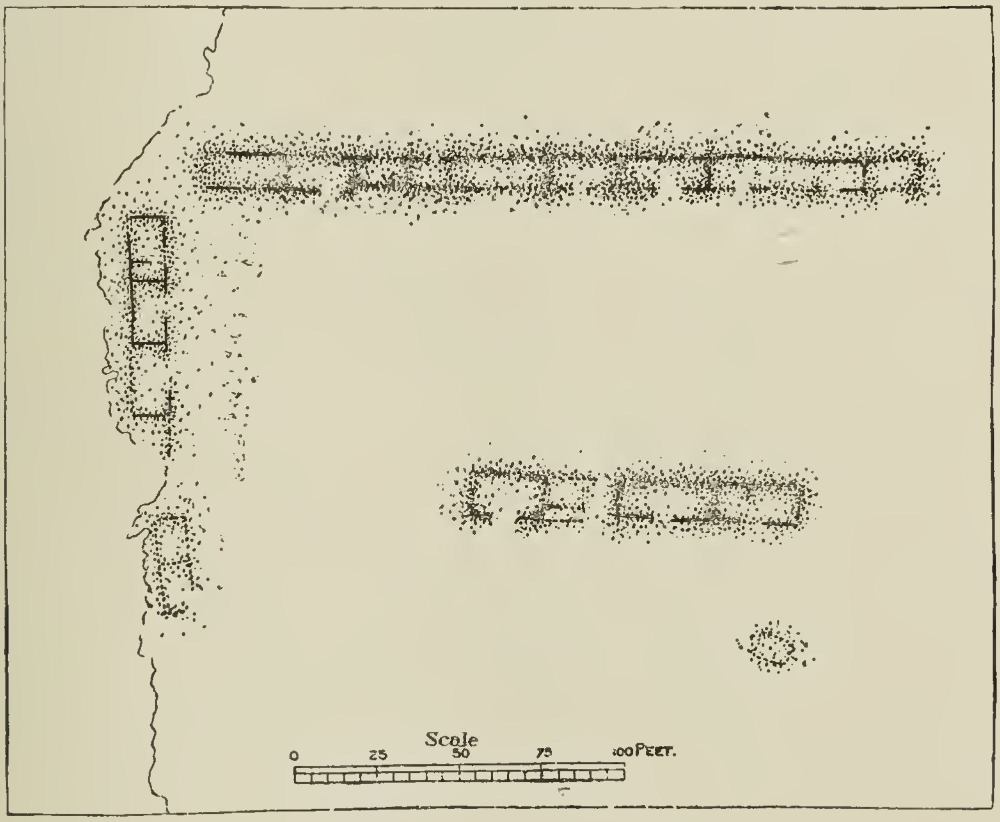

FIG. 3—Plan of ruin showing brief occupancy.

are wholly detached. This indicates that the cluster was occupied by one clan or by related families, while the detached houses were the homes of other families not related to them. Thus we have in this village, comprising about the same number of rooms as the ruin first described, at least four distinct clans.

Detached rooms, such as those shown on these plans, always indicate a family or person not connected directly with the rest of the inhabitants, perhaps the representative of some other clan or people. A stranger coming into a village and wishing to build would be required to erect his house on such a separate site. In the village of Sichumovi (shown in plan in plate XXIV) there are two such detached

houses directly in front of the main row. One had been built and was inhabited at the time when the map was made by a white man who made his home there, while the other, which had been abandoned and was falling into ruin, was built some years before by a Navaho who wished to live in the village. The former was subsequently surrendered by the white man and occupied by some of the natives. The localization of clans worked both ways. Not only was a member of a clan required to build with his own people, but outsiders were required to build outside of the cluster.

The same requirement is illustrated in plate XXII, which shows the plan of Hawikû, one of the ancient "Seven Cities of Cibola," near the present Zuñi. The standing walls which occupy the southeastern corner of the ruin are the remains of an adobe church, while the buildings which stood near and to the north of it, now marked only by lines of débris, were the mission buildings and offices connected with the church. They are pointed out as such by the natives of Zuñi to-day. All these buildings were set apart and were distinct from the village proper, which occupied the crest of the hill, while the buildings mentioned were on the flat below.

This was the first discovered city of Cibola,[1] the first pueblo village seen by the friar Niza in 1539, and the first village stormed by Coronado and his men in 1540. It was abandoned about 1670 (?) on account of the depredations of the Apache. The plan shows that the site was inhabited for a long time, and that the village grew up by the addition of room after room as space was needed by the people. Notwithstanding the fact that no standing walls remain, and that the place was abandoned over two centuries ago, six or seven house-clusters can still be made out in addition to the buildings erected by or for the monks in the flat below. Dense clustering, such as this, indicates prolonged occupancy by a considerable number of people, and probably two centuries at least would be required to produce such a plan. The long and comparatively narrow row to the left of the main cluster suggests an addition of much later date than the main portion of the village.

The maps of the villages Walpi, Sichumovi, Hano, Mishongnovi, Shipaulovi, and Oraibi, which are presented herewith, show the distribution of the clans at the time the surveys were made (about 1883). At first glance the clans appear to be located with the utmost irregularity and apparently without system, but a closer study shows that notwithstanding the centuries which have elapsed since the period covered by the old traditions of the arrival of clans[2] the latter are in a measure corroborated by the maps. It is also apparent that notwithstanding the breakdown of the old system, whereby related peoples were required to build together, traces of it can still be seen. It is a matter of regret

[1] See Hodge, First Discovered City of Cibola, in American Anthropologist, VIII, April, 1895.

[2] These traditions are given in detail in the preceding paper.—ED.

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PLAN OF SHIPAULOVI SHOWING DISTRIBUTION OF CLANS

that the data are incomplete. The accompanying table shows the distribution of the families within the villages at the time of the surveys, but some of the clans represented, which do not appear in the traditions collected, are necessarily given as standing alone or belonging to unknown phratries, as their phratral relations were not determined. The clustering of houses was a requirement of the phratry rather than of the clan.

Distribution of families

	Walpi	Sichumovi	Hano	Mishonginovi	Shipaulovi	Oraibi	Total families
Bear families			6	9	6	5	26
Rope families				5			5
Spider families	1					2	3
Snake families	5					1	6
Cactus families	1						1
Horn families	5						5
Flute families	2						2
Firewood families				3			3
Eagle families	1		8	8		6	23
Sun families	1	1	2	1	15	9	29
Hawk families				2		1	3
Katcina families	2			2		1	5
Paroquet families				1		10	11
Cottonwood families			3				3
Asa families	3	9	1				13
Badger families		3		8		13	24
Water (Corn) families	1		4	5		9	19
Water (Cloud) families	8	3	6	4	1		22
Reed families	6					25	31
Lizard families	1	4	1			14	20
Rabbit families	3	1				11	15
Sand families				1		8	9
Tobacco families	1	1	2				4
Sivwap (Shrub) families	2						2
Coyote families	2		2	1		17	22
Owl families	2					9	11
Red Ant families	7						7
Bow families						4	4
Squash families				3		1	4
Snow families	3						3
Batkin families		1					1
Moth families		1				1	2
Crane families						1	1
Mescal-cake families						1	1
	57	24	35	53	22	149	340

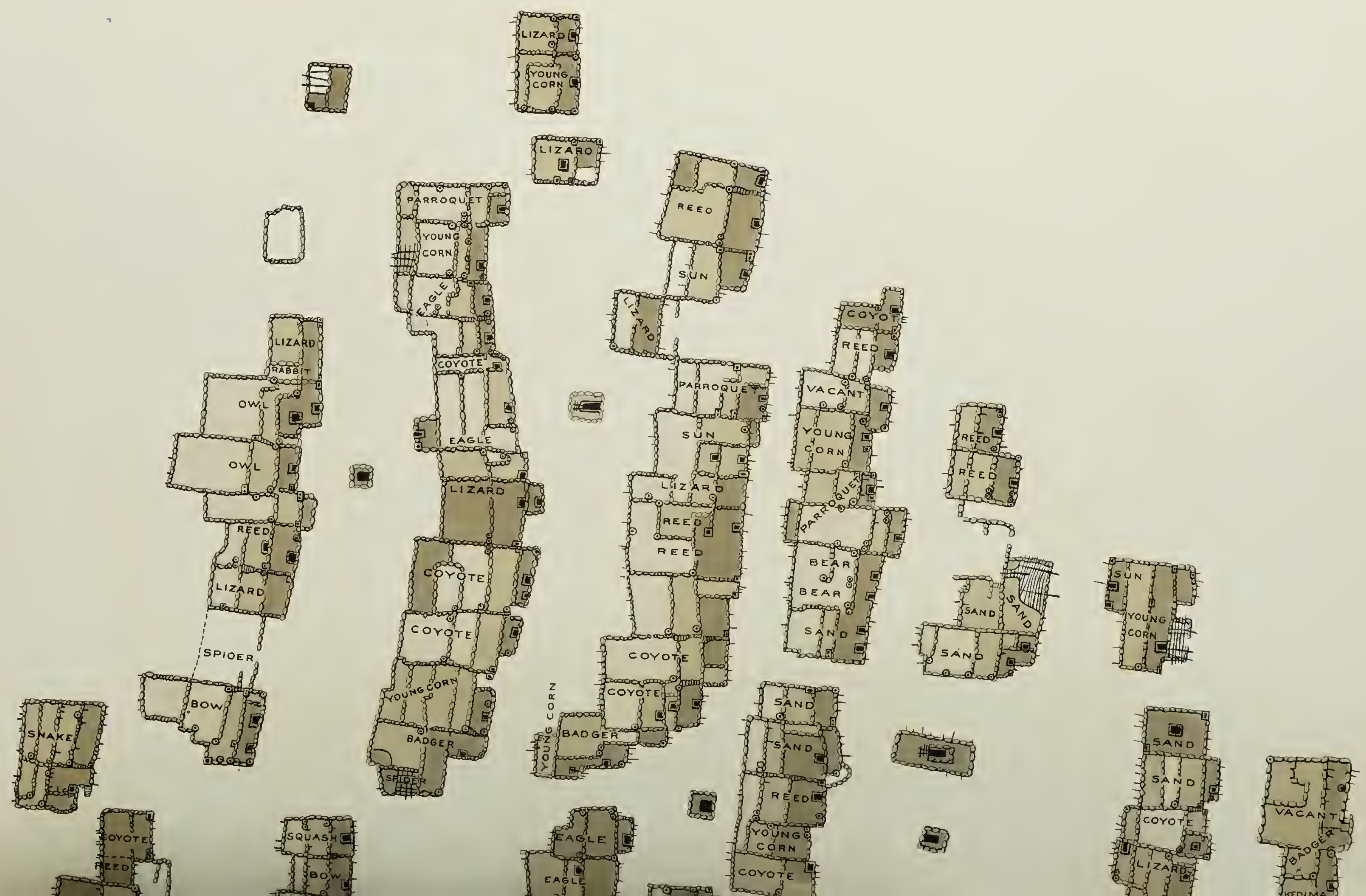
The determination of the clans shown on the maps was made by the late A. M. Stephen, whose qualifications for the work were exceptional. Doubtless there are some errors in it, for it is a difficult matter to

determine the relationships of nearly 400 families, and the work was brought to an end before it was entirely finished. But the maps illustrate a phase of life of the village builders which has not heretofore attracted attention, and which has had a very important effect on the architecture of the people.

Through the operation of the old custom of localizing clans, although it is now not rigidly adhered to as formerly, the plans of all the villages have been modified. The maps here presented show them as they were in 1883, but in a few cases known to the writer the changes up to 1888 are shown by dotted lines. If now or in the future new surveys of the villages be made and the clans be relocated, a mass of data will be obtained which will throw much light on some of the conditions of pueblo life, and especially on the social conditions which have exercised an important influence on pueblo architecture.

The table showing the distribution of families in the villages presents also the number of families. The most numerous were the Water people, comprising in various clans no fewer than 121 families, or over a third of the total number. These were among the last people to arrive in Tusayan and they are well distributed throughout the villages. It will be noticed, also, that while a scattering of clans throughout the villages was the rule, some of them, generally the older ones, were confined to one village or were concentrated in one village with perhaps one or two families in others. The Snow people were found only in Walpi, but these may be properly Water people and of recent origin. The Snake people were represented by 5 families in Walpi and 1 in Oraibi, although they were among the first to arrive in Tusayan, and for a long time exercised proprietary rights over the entire region and dictated to each incoming clan where it should locate. The largest clan of all, the Reed clan, was represented by 6 families in Walpi and 25 in Oraibi, a total of 31 families, or, by applying the general average of persons to a family, by 155 persons. In Oraibi, the largest village, there were 21 distinct clans, although 7 of them were represented by only 1 family each. In Shipaulovi, the smallest village, there were 20 families of 2 clans, and three-fourths of the inhabitants belonged to one of them. In addition there is one family of the Water people, and in fact in each of the villages one or more clans is represented by one family only. It will be noticed that in Shipaulovi the two clans were still well separated and occupied distinct quarters, although the houses of the village were continuous.

The scattered appearance of the clans on the maps is more apparent than real. It is unfortunate that the phratral relations of the clans could not be completely determined, and it is probable that were this done the clans would be found to be well grouped even now. Even the insufficient data that we have appear to show a tendency on the part of the clans to form into groups at the present day, notwithstand-


LIZARD
YOUNG CORN
LIZARO
PARROQUET
YOUNG CORN
EAGLE
REED
SUN
LIZARD
COYOTE
REED
VACANT
YOUNG CORN
PARROQUET
REED
REED
LIZARD
RABBIT
OWL
OWL
REED
LIZARD
SPIOER
BOW
SNAKE
COYOTE
EAGLE
LIZARD
COYOTE
COYOTE
YOUNG CORN
BADGER
SPIDER
PARROQUET
SUN
LIZARD
REED
REED
COYOTE
COYOTE
BADGER
YOUNG CORN
BEAR
BEAR
SAND
SAND
SAND
SAND
SUN
YOUNG CORN
SAND
SAND
REED
YOUNG CORN
COYOTE
SAND
SAND
COYOTE
LIZARD
VACANT
BADGER
COYOTE
REED
SQUASH
BOW
EAGLE
EAGLE

PLAN OF ORAIBI SHOWING DISTRIBUTION OF CLANS

ing the partial disintegration of the old system. At the present time the house of the priestess of the clan is considered the home of that clan, and she has much to say about proposed marriages and other social functions. There is no doubt that in ancient times the localization of clans was rigidly enforced, as much by circumstances as by rule, and the ground plans of all the ruins were formed by it. As has been before suggested, a resurvey of the villages of Tusayan and a relocation of the clans, after an interval of some years, would probably develop data of the greatest value to the student of pueblo architecture, when compared with the plans here presented.

MOUNDS IN NORTHERN HONDURAS

BY

THOMAS GANN

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ILLUSTRATIONS

MOUNDS IN NORTHERN HONDURAS

By Thomas Gann

INTRODUCTION

Such parts of British Honduras as have thus far been explored have proved extraordinarily rich in archeologic material of interest; but, unfortunately, owing to the impenetrable character of the bush, by far the greater part of the colony remains unexplored.

One remarkable fact in connection with the distribution of mounds, or cerros, throughout the colony is that wherever they exist good maize-producing land is certain to be found, consequently the present Indians, taking advantage of their forefathers' experience in removing their villages (which, owing to the rapid exhaustion of the soil, they are compelled to do at frequent intervals), invariably make their clearings in the vicinity of these groups of mounds, confidently anticipating a good crop of maize.

Near the village of Corozal, in the northern district of the colony, a clearing of about 500 acres was made some years ago, which was subsequently planted with sugar cane, and is now known as the estate of Santa Rita. When the clearing was first made between forty and fifty mounds were discovered, and it was found that the majority of these were built to a great extent of large blocks of limestone, many of which were squared, as if they had previously formed part of a building. As stone is scarce in the vicinity a number of the mounds were completely destroyed in order to obtain the stone for erecting houses and water tanks. Of the pottery and other remains which must have been brought to light during the demolition of these mounds there is unfortunately no record, and the probability is that they were thrown away as useless.

DISTRIBUTION OF THE MOUNDS

The site chosen by the builders of these mounds for their residence is one of the most favorable for many miles around, being on an extensive plateau 50 to 100 feet above the sea level, about one mile inland, and separated from the sea by a belt of swampy, malarial land, which must have formed a strong natural protection against enemies

from seaward, the main, if not the only, direction from which they might be expected. The soil upon the plateau is remarkably productive. The only apparent drawback to the location is that the nearest fresh-water supply, namely, Rio Nuevo, is at a distance of several miles; but, as will be shown, this defect was remedied by the construction of underground reservoirs.

When the work of excavation among these mounds was first begun,

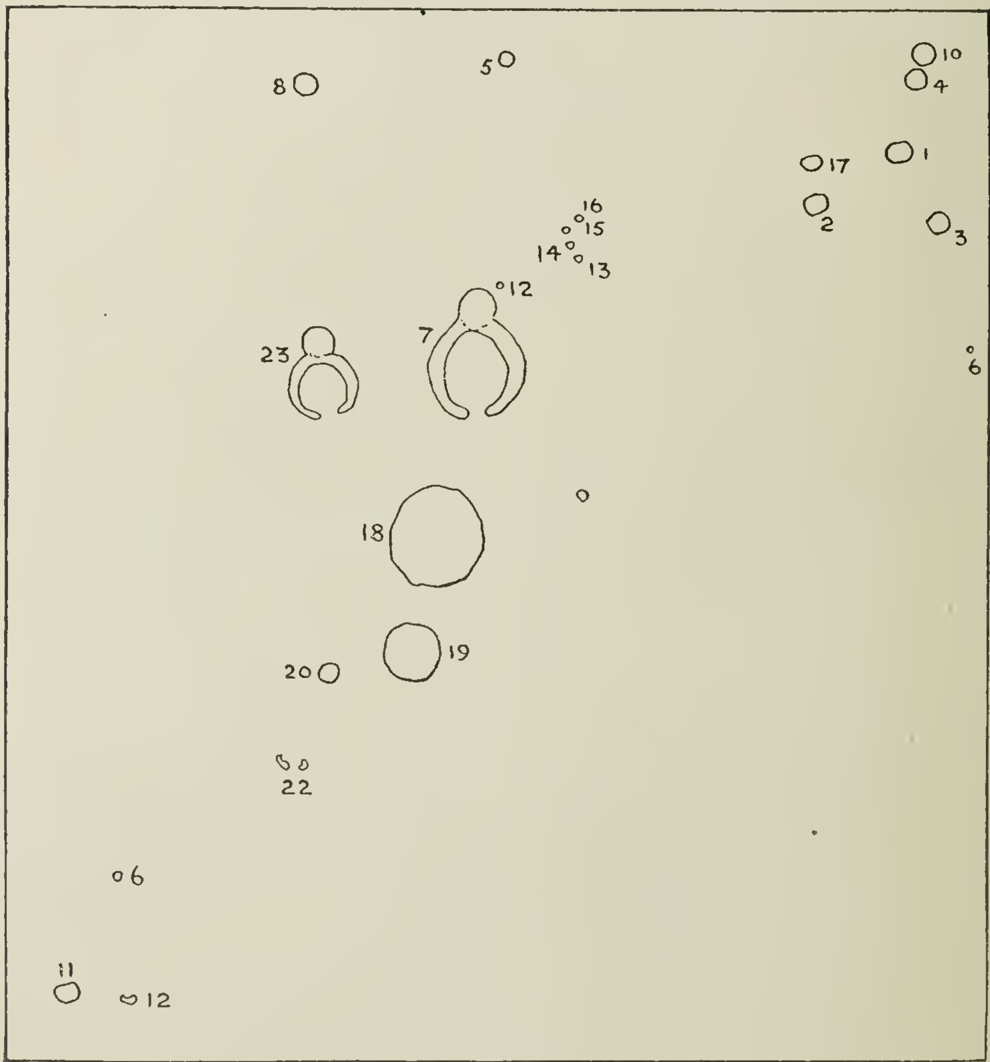


FIG. 4—Plan of mounds at Santa Rita.

in 1896, thirty-two of the original number were intact. Of these, sixteen have, up to the present time, been thoroughly explored, and it is the object of the present paper to give some account of their construction and contents.

For descriptive purposes the explored mounds may be divided into three classes, as follow:

1. Mounds constructed over buildings.
2. Mounds containing, superficially, two broken pottery images, and

more deeply, or on the ground level, painted pottery animals either within or immediately adjacent to a pottery urn.

3. Mounds which constitute the solitary representatives of a class, and those of unknown or doubtful use.

CHARACTERISTICS OF MOUND 1

The most important of the mounds erected over buildings (class 1) was without doubt that marked 1 on the accompanying plan (figure 4), as the walls of this building were covered externally with painted stucco, which, notwithstanding the dampness of the climate, was found to be in an excellent state of preservation. This mound was situated near the edge of the plateau, at a distance of 580 yards from the large central mound (7). Before excavations were commenced the mound was found to be 290 feet in circumference, 80 feet in length, 66 feet in breadth, and 14 feet in height. A tradition existed among some of the older employees on the estate of Santa Rita that when the brush was first cleared from this mound there stood on its summit a wall 4 or 5 feet high and several yards long, which had been pulled down in order to obtain the squared stone of which it was built. No trace of this wall was seen when the outside of the mound was examined, but by digging into it, toward its east end, a wall was discovered at a depth of a few inches, which, on being cleared, was found to be a little over 4 feet long. At a height of 4 feet 10 inches above the ground-level a triangular stone cornice projected, and below this the wall was entirely covered with painted stucco, the device on which will be described later. Above the cornice the wall was composed of roughly squared stones, and varied from 2 to 3 feet in height. It rested on a floor of smooth, hard, yellowish cement, which was continuous with the painted stucco. Its south end was broken down, and its north end joined the north wall of the building covered by the mound.

Unfortunately, when this wall was discovered there was no tracing paper to be had in the district, and I had to copy the design painted on the stucco with a very imperfect improvised substitute. After I had traced the outline of about half the mural painting, some mischievous Indians came in the night and removed the whole of the stucco. This is especially to be regretted, as toward the broken end of the wall a number of hieroglyphics were massed together, reaching from the cornice to the floor, which were entirely lost.

The north wall of the building was the only one entirely unbroken throughout its extent below the cornice. It measured 35 feet 8 inches in length and its center was pierced by a doorway 3 feet in width. The upper part of the mural decoration on this wall was in a remarkably good state of preservation, but, owing probably to dampness,

nearly the whole of the lower part had become effaced. Fortunately, on that part of the wall adjacent to the doorway the painting was perfect from cornice to floor. This wall, like the others, rested on a layer of hard cement continuous with the stucco which covered it.

Of the west wall, which was the last to be exposed, 9 feet remained standing. It was the best-preserved wall in the whole building, the entire mural painting, from cornice to floor, being almost perfect.

Of the south wall of the building not one stone remained upon another; but as the mound was built mainly of squared stones, and as there were many such in the line of this wall still retaining pieces of painted stucco, it seems probable that this wall was decorated similarly to the others.

The triangular stone cornice extended along all the walls at a uniform height of 4 feet 10 inches from the ground; its upper surface was oblique, its lower surface horizontal; and it projected 3½ inches from the wall. The layer of hard cement on which the building rested could be traced outward from its walls a distance of 4 or 5 feet, where it ended in a jagged edge. Its superficial layer was light yellow in color, and so hard that it was difficult to make any impression on it with a machete; the deeper layers, however, were much softer. This cement layer was placed about 2 feet above the ground level.

The interior of the building was without cornice, and was completely covered with plain, unpainted stucco. The floor was on a level with the ground outside the walls, and was of the same hard cement which covered it.

The plain stucco covering the interior of the building was in very close contact with the wall, from which it could not be removed, except in small pieces. The painted stucco on the outside, on the other hand, was separated from a subjacent layer of similar material by a very thin layer of dark, friable clay, rendering it easy to remove large pieces of the stucco without much damage to the painting. The second layer of stucco also bore traces of painted figures, but they were so indistinct that even if the superficial layer had all been carefully removed, it would have been impossible to copy them. Beneath the second layer there existed a third layer, which also bore faint traces of having originally been covered with colored devices.

The greater part of the walls above the cornice had been broken down, but in places they rose to a height of 5 feet. The mortar used in constructing the building was soft and friable, and contained large lumps of limestone. The walls were throughout uniformly 14 inches thick.

During the excavation of this mound a large number of potsherds were found; some of them roughly made, others nicely decorated with geometric devices in red, black, and yellow; a few were glazed. Two stone spearheads were also found—one, triangular in shape and 4½ inches in length, was made of yellow flint; the other, of leaf shape, 3

inches in length, was chipped from translucent, grayish flint; the points of both had been broken.

The greatest possible care had evidently been taken by the builders of this mound to preserve, both from weather and from accident, that portion of the painted stucco which remained intact. This was more especially apparent in the north and west walls, where the method adopted was as follows: Built up from the cement floor, parallel with the walls and at a distance of 1 to 2 inches from them, was a wall consisting of rough blocks of limestone, reaching nearly as high as the cornice; extending outward and downward from the latter, a layer of cement 7 to 8 inches thick met this wall and continued for several feet toward the circumference of the mound. By this ingenious arrangement all the rain which drained along the wall was, on reaching the upper surface of the cornice, directed outward along the roof-like layer of cement, so that it could not reach the painted stucco, which was also protected from the surrounding damp earth by the rough wall built up parallel with it, but not touching it. The only injury, in fact, which the wall suffered was from the roots of plants which had penetrated the cement layer and fixed themselves to the stucco. In removing some of these it was almost impossible not to injure the painting.

PAINTING ON THE WALLS WITHIN MOUND 1

Of the painting on the east wall (figure 5), unfortunately, only a rude outline of the least interesting and important part has been preserved. The table of hieroglyphics, which should have occupied the whole of the left of the picture, as has been before explained, has been irredeemably lost. Next to these, and occupying the central part of the picture, were depicted two human beings who, from their attitudes, evidently were represented as engaged in combat. One of the figures is gone, only a part of his weapon being visible. The outline of the other is shown at *b* in the figure. In the original each of these warriors stood with the body thrust forward, the right foot advanced, and the right hand, in which was held a cruciform weapon, uplifted. The warrior on the left was apparently warding off a blow with the handle of his battle-ax. There can be little doubt that these weapons were the ordinary stone ax-heads—numbers of which are found in the vicinity—hafted in a wooden handle and held in place by a thong of leather or henequen fiber. This is well shown in the original, but in the rough outline given in figure 5 it is not by any means so apparent. On the extreme right of the picture is the upper part of the figure of an old man, seemingly watching the combat. This is probably meant to represent the god Quetzalcoatl, or Cuculcan of the Maya, as in headdress and profile he bears a marked

resemblance to figure 8 of plate XXX, which is undoubtedly meant to represent this deity. Figures *b* and *c* are both decorated with elaborate feather-ornamented headdresses. The warrior in the center appears to be carrying a human figure on his back.

That portion of the north wall which extended between the east wall and the doorways was decorated with ten figures (plate XXIX). Unfortunately, the paintings from the lower part of the first eight figures to the ground had been almost destroyed by dampness, owing to the fact that the protecting wall had bulged inward and was there in contact with the stucco. The first seven figures evidently represent a line of captives, as all their wrists are bound. The first, second, and third

a *b* *c*

FIG. 5—Printed stucco on east wall, mound 1, Santa Rita.

figures are attached to each other by the rope which binds their wrists, as are also the fourth and fifth, and the fifth and sixth. The rope passes over the right shoulder of the eighth figure, and is held by him with both hands (which appear to be both left hands) and ends with the ninth figure; but owing to the obliteration of a portion of the painting at this point it is impossible to see what he is doing with it.

All the figures have very elaborate headdresses, composed chiefly of plumes of red, yellow, and green feathers, together with varicolored bands, squares, and circles, which are no doubt meant to represent metal work and jewels. The headdress of figure 4 is further ornamented with a piece of platted work, the upper part colored red, the

PAINTED STUCCO ON EAST HALF OF

NORTH WALL, MOUND 1, SANTA RITA ⅙

LITH. BY A. HOEN & CO. BALTIMORE MD

lower blue, not unlike various colored ornaments made by the modern Maya from henequen fiber. The front of the headdress of figure 1 is ornamented with the head and outstretched wings of an eagle; that of figure 2 with the head of a dragon, in which the lower jaw appears to be wanting; that of figure 3 also with the head of a dragon. Figure 4 has a square human face placed well above and in the front of the headdress. Figure 5 has a dragon's head in front, immediately above the face. Figure 6 has a small dragon's head in front of the headdress and a large one behind it. Figure 7 has in front, immediately above the face, a tiger's head, and at the back a dragon's head. In figure 8, owing to the obliteration of the stucco, the upper part of the headdress is wanting. The headdress of figure 9 has in its front the head of an animal resembling a raccoon. The individual himself is standing upon an animal (probably a pepisquinte) at full gallop. His left foot rests on the animal's head, his right foot on its rump.

Each figure is ornamented with large earrings, whose prevailing shape is oval or circular, and which have pendants hanging from their centers. Figure 1 has projecting from the right ala of the nose an ornament somewhat resembling in shape a right-angle triangle, the side opposite the right angle being divided into three steps. In figure 2 the nose ornament consists of two nearly circular objects attached to the tip of the nose, one in front of the other. Figure 4 is similarly decorated. Figure 5 has projecting from each ala of the nose ornaments similar to that in the right ala of the nose of figure 1. Figure 6 is decorated with a **J**-shape lip ornament. Attached to the right ala of the nose of figure 9 is a small object which resembles half a bow. Of figure 10 only the outline has been preserved; it is, therefore, impossible even to conjecture what it was intended to represent.

Immediately beneath figure 9 is a serpent's head, decorated with an elaborately ornamented circular collar; the body is broken off short, and the small portion remaining has numerous curved spines on its dorsal surface.

Immediately beneath figure 10 is depicted a highly conventional representation of a fish with a plume projecting from its mouth.

The second half of the north wall, extending from the doorway to the west wall, was decorated with nine figures (plate XXX). Unfortunately the whole of the lower portion of this part of the wall had been destroyed by dampness, and a great part of three of the figures had also been obliterated. The first figure on this part of the wall has not been copied, as it was precisely similar in design to the corresponding figure on the opposite side of the door (shown in plate XXIX, figure 10). Figure 1 appears to be holding in each extended hand a conical object as a gift or offering. In excavating a mound some eight miles from Santa Rita a number of broken clay figures were discovered,

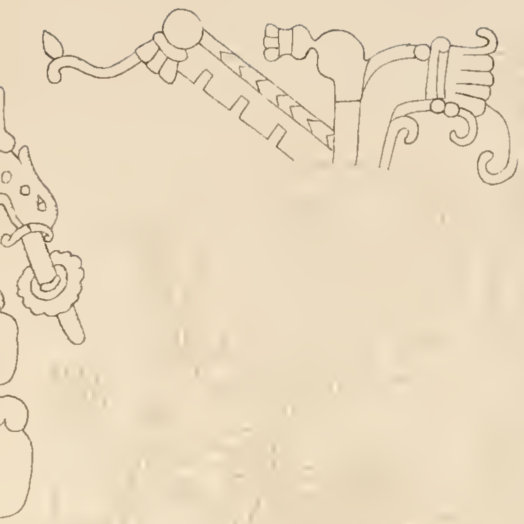
one of them holding in its hand an object almost exactly similar to that held in the right hand of this figure, and in unearthing the idol shown in plate XXXII, figure 2, a similar object was found. Figure 2 was so indistinct that it was impossible to trace it properly. The original was evidently meant to represent a highly ornate structure, the upper part of which is shown in the figure to be supported on each side by two monsters, a part of one of which is seen in the lower left-hand corner of the figure. Figure 3 is holding in the left hand, apparently as an offering, a dwarf or a baby.

On comparing this figure with that sculptured on the left slab of the Temple of the Cross at Palenque[1] it will be seen that a remarkable resemblance exists between them. The facial profiles are almost identical, the headdresses are very similar (except that in the Palenque figure the plumes of feathers are absent), and there is strong similarity in each case between the gift or offering and the mode of presenting it. The Palenque figure appears to be standing upon the head of some monstrous animal, whereas figure 3 is sitting within the widely open jaws of an animal, which, for want of a better term, has hitherto been called a dragon, whose jaws, curved teeth, and eye, with its conventional eye ornament, are clearly shown.

Figures 4 and 5 were much injured by dampness. They will be referred to in dealing with the wall as a whole. The profile of figure 6 differs somewhat from that of all the others. The nose is small, straight, and less Semitic in character, while the forehead is more nearly upright. Figure 7 is apparently undergoing some sort of torture or punishment, as he is trussed up in a very constrained position on a low platform. His right elbow appears to have been either broken or dislocated. Figure 8 probably represents Quetzalcoatl, or Cuculcan of the Maya, the god of the air, whose name in both languages signifies "feathered serpent," as he holds in his right hand a serpent with a plume on its head; moreover, two serpents with feather markings are coiled around his body, and the profile is that which is usually ascribed to this god. The elaborately ornamented feather-work headdresses are prominent in all the figures, as are also the large earrings with long pendants hanging from their centers. The earrings of figures 1, 6, and 8 differ from the others in being square instead of round. In figures 6, 7, and 8 the heads of animals are to be seen in the headdresses, immediately above the faces. It is difficult to say to what animal the head in front of the headdress of figure 6 belongs. That at the back of the headdress is similar to those already described as dragons' heads. A large eagle head is placed in front of the Maxtli of figure 6. The head in front of the headdress of figure 7, the lower jaw of which is lacking, is probably that of a peccary.

[1] Charnay, Ancient Cities of the New World, p. 254.

PAINTED STUCCO ON WEST HALF OF NOR



5

6 7 8

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WALL, MOUND 1, SANTA RITA ⅙

The 9-foot section of the west wall which was left standing presents for examination three figures (plate XXXI). The painting, unlike that on all the other walls, was almost intact from the cornice to the floor, and conveys some idea of what the lower part of the design on the other walls was probably like. The figures on the right and left in the illustration are human, and they appear to be in the act of making offerings to the central figure. The figure on the left is presenting in his left hand an object very similar to that held in the hand of figure 1 of plate XXX. The figure on the right is presenting two severed human heads, one held in each hand, which he is grasping by their long, flowing hair. The upper head still retains its earrings and part of its headdress, consisting of two snakes' heads; also a gorget of beads and pendants. The lower face possesses a mustache and a beard, and is ornamented with earrings, headdress, and a gorget. It is noticeable that the left-hand figure in this plate, seen in profile, is entirely different from any of the other figures on the wall. The nose is long and club shaped, the forehead is prominent, and the face is covered with a beard and mustache. It is probable either that this is meant as a caricature, or that the individual is wearing a mask. The contour of the face held in the right hand of figure 3 is somewhat similar, but in this case the beard and mustache are absent. The same curious triangular nose ornaments are seen projecting from each ala of the nose of figure 3 as are worn by figures 1 and 5, in plate XXIX. The upper part of the headdress is formed by an animal somewhat resembling a monkey in a crouching position. The central figure represents a death's-head within a sort of altar. Speech signs are proceeding from its mouth and from the top of the altar. This is probably meant for Huitzilopochli, the Mexican god of death, who is often represented by a death's-head.

In regarding the painting as a whole, that which strikes one most forcibly is its highly conventional character, and, indeed, this is a peculiarity which seems to be inseparable from all Aztec and Toltec art. Artistic feeling, of which traces are not lacking here and there, seems to have been sacrificed to the one all-important idea of conventionality. The artist appears to have had no conception of perspective, but the minutest detail of dress is most carefully indicated, both in outline and in coloring. The wall was, in fact, not intended as a work of art, but as a pictographic record of certain important events; and looking at it in this light, we can understand why artistic feeling should have been sacrificed to minuteness of detail, for no doubt the most insignificant detail in dress and ornament conveyed a meaning to the initiated which to us is forever lost.

Seven colors were employed in painting the stucco, namely, black, blue, green, gray, red, white, and yellow. On the east wall and the eastern half of the north wall the background is dark blue; on the west wall and the western half of the north wall it is pink.

The faces, arms, legs, and other parts of exposed naked skin are usually red or yellow. The figures themselves, together with all the elaborate details of their dress and ornament, are outlined in fine black lines. When first discovered the colors were very brilliant, but after exposure to the light for a day or two, a great deal of their luster was lost, and it became necessary, as each figure was uncovered, to roof it in with palm leaves in order to protect it from the sun and rain. The figures were exposed one at a time; otherwise, by the time two or three had been copied, the rest would have faded so that it would have been impossible to copy the original colors. A sheet of tracing cloth, sufficient to cover the whole figure, was then tacked over it and an accurate tracing obtained, which was afterward transferred to drawing paper. Any mistake that might have been made in the outline of the figure or its ornaments were then rectified. Finally, the colors were applied exactly as they occurred in the original. By the time the whole had been copied, the earlier exposed figures were much defaced from the action of the weather, and as there was no way of preserving the wall, I removed the stucco on which two of the most perfect of the remaining figures were painted. This, owing to the soft layer at the back of the stucco, already referred to, was readily accomplished.

HISTORICAL DATA GAINED BY STUDY OF MOUND 1

Three interesting questions present themselves with reference to these painted walls:

1. By whom was the building erected and the walls painted?

2. By whom, and why, was the building destroyed, and the mound erected around it?

3. When did these events, severally, occur?

The Builders of the Mound-covered Temple

In answering the first of these questions, the hieroglyphics which still remain will, I think, materially assist us. The large sheet of hieroglyphics on the east wall has, as I have already explained, been permanently lost; but scattered over the rest of the painting are no less than 21 complete glyphs. These are unquestionably of Maya or Toltec origin. The sign of the 20th day—named Ahau—of the Maya month, occurs no less than nine times in the course of the painting, namely, beside figures 2, 4, 5, 7, and 8 of plate XXIX, figures 5, 7, and 8 of plate XXX, and figures 1 and 3 of plate XXXI; and possibly as a component part of the glyph opposite the face of figure 2, plate XXIX, and also of that placed above figure 6, plate XXIX. It will be observed that these symbols differ very slightly one from another and that all of them resemble very closely those given by Landa, and those of the

PAINTED STUCCO ON WEST WALL, MOUND 1, SANTA RITA ⅙

4

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codices. The lower part of the glyph placed immediately above the head of figure 6, plate XXIX, is a typical representation of Imix, the first day of the Maya month; and possibly the upper part of the glyph placed in front of the face of figure 9, plate XXIX, is meant to represent the same day. In the first case there can be no doubt as to the identity of the symbol, for all its characteristic features are present, namely, the black spot at the top, the semicircle of dots below, and below this again the row of perpendicular lines. The second symbol is not by any means so typical. A small circle takes the place of the black spot, the dots are wanting, and the perpendicular lines are hooked at their summits; nor does it seem possible that in the same painting such wide variation should occur.

The outer and upper of the three component parts of the glyph opposite figure 6, plate XXIX, may possibly be meant to represent Akbal, the third day of the Maya month, though it bears a strong resemblance to the Ahau sign.

The lower right-hand part of the glyph opposite the left foot of figure 8, plate XXIX, evidently corresponds to the lower part of the glyph opposite the face of figure 9, plate XXIX; there can be little doubt that both these symbols represent Manik, the seventh day of the Maya month. In dealing with this symbol in his Day Symbols of the Maya Year,[1] Professor Cyrus Thomas says:

> As Brasseur de Bourbourg has suggested, this [i. e., the Manik symbol] appears to have been taken from the partially closed hand, where the points of the fingers are brought round close to the tip of the thumb. Whether intended to show the palm or back outward is uncertain, though apparently the latter. . . . As this interpretation of the symbol is quite different from that given by other writers, some evidence to justify it is presented here.

It will be observed that immediately below the Manik symbol, in front of the face of figure 9, plate XXIX, there is represented a right hand with the fingers flexed toward the tip of the thumb, the back of the hand being outward; the outline of this hand is almost precisely similar to that of the Manik symbol placed immediately above it, thus confirming, I think, beyond question, Professor Thomas's interpretation of the signification of the symbol, both as to the fact of its representing the human hand and as to the position in which the hand was held. The lower right-hand part of the glyph placed above figure 4, plate XXIX, bears a strong resemblance to the symbol used in the Troano codex to represent Cauac, the 19th day of the Maya month. The upper right-hand division of the glyph placed in front of the head of figure 8, plate XXX, is remarkably like the symbol used in the codices for Ben, the 13th day of the Maya month; the chief difference between the two is that in the codices the line which divides the glyph in two parts is horizontal, whereas in the painting it

[1] Cyrus Thomas, Day Symbols of the Maya Year; Washington, 1897, p. 232.

is vertical. Immediately behind the head of the individual portrayed in figure 5, plate XXIX, will be observed a gylph made up of five component parts, two above and three below. The upper left-hand division and the lower central division unquestionably form together the Maya symbol for the cardinal point east, named "likin"—the lower division standing for "kin," day, and the upper or Ahau symbol for "li," the consonant element of which is "l." This is the generally accepted interpretation of the symbol, but in the present case it can hardly hold good, for above the Ahau symbol are two bars and three dots, which stand for 13 (each bar representing 5, and each dot 1), showing that the Ahau symbol, though combined with the kin symbol, is not, at least here, used phonetically, but is employed simply to represent the last day of the Maya month.

Turning again to the figures themselves we can not help being struck with their remarkable resemblance to those of Yucatan and southeastern Mexico on the one hand, and to those found in the ruined cities of Guatemala and Honduras on the other. The most striking points of general resemblance are the similarity in shape and fashion of the headdresses, sandals, wrist and leg ornaments, the conventional treatment to be observed in all the human figures, and the fact that all are shown in profile. In the receding forehead, hooked nose, and somewhat prominent chin, which are characteristic of nearly all the figures, they resemble perhaps more closely the bas-reliefs of Palenque and Lorillard City than those of Yucatan and Honduras. The vast headdress, composed of jewels and plumes of feathers, decorated in most cases with the head of an animal immediately above the face—employed as a distinctive sign or badge by the upper class—the enormous square or round ear ornaments, with a pendant from the center, the sandals, elaborately decorated from heel to instep, and fastened in front with a gaily-colored bow, the wristlets of beads, also in many cases decorated with bows, the circlets, worn round the legs either just above the knee or just above the ankle, together with the nose and lip ornaments, are all common to Mexico, Yucatan, Guatemala, and Honduras.

But besides showing these points of general resemblance, certain of the figures appear, when allowance is made for the differences which would necessarily exist between a bas-relief cut in stone and a painting, to be almost identical with those found elsewhere. These are figures 3, 4, 5, and 8, plate XXX. The resemblance between figure 3, plate XXX, and the left-hand figure in the Temple of the Cross at Palenque has already been adverted to, and this figure bears an equally strong resemblance to a bas-relief in stone from the ruined city of Labphak, in Yucatan.[1] In each case the figure is holding elevated in one hand a small object, on which is squatting a dwarf or baby, which is

[1] John L. Stephens, Incidents of Travel in Yucatan, vol. II, p. 164.

apparently being presented as an offering or sacrifice. The dress of the two figures is very similar. A huge headdress projecting forward for a considerable distance above the face is ornamented with feathers and jewels; a bead-decorated cape and the usual large earrings are worn by both. In the glyph placed above the Labphak figure is seen a cross, and the same symbol is also to be observed in the headdress. In the glyph placed between figures 3 and 4, plate XXX, the same symbol also appears. The cross is in both cases of the same shape.

In figures 4 and 5, plate XXX, the lower part is unfortunately very much damaged; but if the upper part of the figures be compared with the bas-relief sculpture in the Temple of the Cross at Palenque, it will be seen that the subject is the same. In the center of the picture is a symbolic bird with a long tail and eagle's talons, standing in the one case on top of a cross, in the other on top of an Ahau symbol, and on each side is a human figure apparently making offerings to this bird. Above figure 4 the cross forms a prominent part of the hieroglyph.

The resemblance between figure 8, plate XXX, and the bas-relief in stone from Casa 4 at Palenque[1] has already been noticed. The huge prominent noses, the toothless jaws and prominent chins, the similar headdresses with the eagles' heads in front, and especially the feather-decorated serpents twined around the bodies, show, without doubt, that both of these figures are meant to represent the god Quetzalcoatl.

On the strength of this evidence, then, I think we may fairly infer:

(*a*) That this building was the work of people of the same nation which built the ruined cities of Yucatan, Gautemala, and Honduras; but that, as their style and method of execution were more like those of the builders of the cities of southeastern Mexico, they were probably more closely allied to, and more nearly contemporaneous with, them than with the builders of the other cities.

(*b*) That in the absence of all other evidence the hieroglyphics would alone prove that the building was the work of a branch of the Maya Toltec nation.

The Destroyers of the Mound-covered Temple

We can pass now to the second question, namely, by whom, and why, was the building destroyed and the mound erected over it?

In certain other mounds at Santa Rita, immediately to be described, there were found, buried superficially in each mound, the fragments of two pottery images, and more deeply a number of small painted pottery animals, the latter either inside of or immediately adjacent to large pottery urns. The similarity between these clay figures and

[1] John L. Stephens, Incidents of Travel in Central America, vol. II, p. 353.

those painted upon the temple wall is very marked. The same conventional treatment is to be observed in both. The huge head, the small body and limbs, the elaborate headdress, the large round earrings, and highly ornate sandals are the same; and in two of the clay images, figures 1 and 3, plate XXXII, monstrous heads similar to those worn by the figures on the stucco are worn as ornaments in front of the headdresses. Figure 2, plate XXXIV, represents the lower part of the face of one of these clay idols. If it be compared with the head of figure 1, plate XXXI, and with the head held in the left hand of figure 3, plate XXXI, both from the wall, it will be seen that the beard and mustache are treated in the same conventional manner in each. In figure 1, plate XXXII, the curious ornament below the left eye of the face in the idol's headdress is the same as that below the eye of figure 8, plate XXX. Again, the ornament held in the hand of figure 1, plate XXX, is precisely similar to one dug up with figure 2, plate XXXII. These instances of correspondence in detail are very numerous, but enough has been cited to show that it is impossible to look upon the resemblance between the clay figures and the painted stucco as fortuitous. We must, on the contrary, regard them as the work of the same people. It is of interest to note here that the monster's face which decorates the headdress of figure 3, plate XXXII, is the counterpart of a face found at Quirigua, and described at some length by Mr Diesseldorf.[1] There is also a close resemblance in coloring, ornamentation, and general style between the painted stucco and the painted pottery animals. The same colors are used and the same fine black lines are employed for outlining in each case. If figures 3, 4, and 7, of plate XXXIV, be compared with the snakes' heads seen to the right of figure 8, plate XXX, and with the snake's head below figure 9, plate XXIX, it will be seen that exactly the same ornament is placed both above and below the eye in each case. The central part of mound 2, from which some of these animals came, was constructed almost entirely of large blocks of limestone, and on some of these, which were squared, traces of painted stucco were still visible, similar to that found on some of the stones which formed the mound around the painted wall and no doubt having the same origin, i. e., the broken down south wall of the building. Mound 2 had also been erected over a building, and it was on its floor that the urn and animals had been placed when the top was added to the mound. Furthermore, if the painted walls of the temple had been wantonly destroyed by an enemy, or by some barbarous tribe coming down from the north, the destruction would have been complete; nor would they have taken such care, as we have seen was taken, to preserve the greater part of the painting by erecting a mound around it.

[1] See Aus den Verhandlungen der Berliner Anthropologischen Gesellschaft. Ordentliche Sitzung vom 21ten Dec., 1895.

We may therefore, I think, safely conclude that the builders of the temple or their descendants were also its destroyers, though their method of destruction—paradoxical as it sounds—preserved it for posterity probably better than any contrivance which they could have employed for its permanent preservation.

As to the reason for this partial destruction and burial of the temple, we know that the Maya regarded the five intercalary days at the end of each year as unlucky and ill-omened, and that during them they were in the habit of destroying their household pottery utensils, together with some of their small household gods, which were renewed again for the new year. Furthermore, they intercalated twelve and one-half days at the end of every cycle, or period of fifty-two years, which were regarded as especially ill-omened.[1]

It is not improbable that this painted stucco partially underwent the fate of other images of the gods during one of these especially unlucky periods at the end of the cycle;[2] for, as I have pointed out, the stucco had evidently been renewed twice, as two layers were found beneath the most superficial one. These obliterations and renewals may have taken place periodically as the unlucky periods came round and passed, till finally the period came when the temple was itself destroyed in the manner already described.

While searching for mounds in the bush about 15 miles north of Santa Rita I came across a large inclosure, the walls of which were 4 feet thick, and, though much broken down, had been about 6 feet in height. The inclosure was in the form of a parallelogram, three-quarters of a mile long by half a mile broad. Within it were the ruins of a church, in very fair preservation, the chancel, with the exception of its roof, being quite perfect. This had evidently been a fortified inclosure built by the Spaniards, and, from the fact that it was so near to Bacalar, which was one of their earliest settlements in Yucatan, and that all record of it has been lost, it was probably erected not very long after the conquest. It may be that the worshipers at the Santa Rita temple, finding themselves in such close proximity to a fortified Spanish settlement, and knowing that the conquerors took every means in their power to propagate the new and eradicate the old religion, as a last resort employed this method of preserving at least a portion of the sanctuary of their god from the sacrilegious hands of the invaders. Either of the foregoing explanations would account for the manner in which the temple had been at the same time destroyed and preserved.

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[1] See Antonio Gama, Descripcion, parte 1, p. 52 et seq. Dr Cyrus Thomas denies any intercalation beyond the annual one, and his proof certainly appears convincing. See Cyrus Thomas, The Maya Year, p. 48.

[2] "As soon as they were assured by the new fire that a new century, according to their belief, was granted to them by the gods, they employed the thirteen following days . . . in repairing their temples and houses and in making every preparation for the grand festivals of the new century."—Francisco Clavigero, History of Mexico, book 6, sec. XXVI.

Probable Date of the Building of the Temple

Let us turn to the probable age of the temple. We know on the authority of Veytia and Ixtlilxochitl, probably the most reliable of the historians who chronicle the dim and uncertain early history of the Toltec, that the remnant of that nation after pestilence and disastrous wars had decimated them, migrating from Tula, found their way, some to southern Mexico, where they founded Palenque and Lorillard, others farther south still to Guatemala and Honduras, while others turned eastward into Yucatan.[1] This migration took place somewhere about the end of the eleventh century.[2] A long period must have been necessary for the scattered remnant of the Toltec to have made this long journey of nearly 1,000 miles, before reaching the shores of the Caribbean sea, on foot, crossing rivers, swamps, and mountains, and encountering everywhere a barrier of dense and impenetrable bush. Probably a century would be rather under than over the mark in estimating the time necessary for this emigration and for the people to have become sufficiently settled in their new home to erect an elaborately decorated temple. This would place the date of the erection of the temple somewhere between the end of the twelfth and the end of the fifteenth century; but if, as I before suggested, the painted stucco was renewed only at the end of every cycle of fifty-two years, and the burial of the temple was caused by the fear of Spanish invasion, then, as there were two layers beneath the outermost layer of stucco, the temple must have been at least 104 years old at the time of its destruction; and judging from the brightness of coloring and excellent preservation of those parts of the painting spared by the dampness, the outer layer could not have been applied for any great length of time when the mound was erected which preserved it to the present day—which would place the date of the erection of the temple toward the end of the fourteenth or beginning of the fifteenth century.

The general design painted on the stucco appears to be continuous around the building, and to represent, first, a battle; next, the prisoners being led captive, some undergoing torture; finally, the worship of Quetzalcoatl and the offering of sacrifices to the god of death. On the east wall was depicted a spirited contest between two warriors, though the tracing in this case gives but a poor idea of the original. The first eight figures of the east half of the north wall evidently represent prisoners. The west half of the north wall shows the worship of Quetzalcoatl, the god himself being depicted at the western extremity of the wall elaborately dressed and ornamented.

[1] Francisco Clavigero, History of Mexico, vol. I, book 2, p. 89.
[2] Ixtlilxochitl, Historia Chichemeca, cap. 3. Veytia, Hist. Antiqua, vol. I, cap. 33.

On the west wall two heads and other objects are being offered to the Mexican god of death.

Figure 3, on the west wall, offering the heads—one in each hand—is obviously one of the victors; but there appears to be little or no difference between his appearance, dress, and ornamentation and that of the prisoners shown in figures 1 to 8, plate XXIX, which would apparently indicate that the combatants were, if not of the same, at least of kindred nations.

OTHER MOUND-BURIED STRUCTURES

Two other mounds at Santa Rita were erected over the ruins of buildings, namely, those marked 3 and 4 in the plan, figure 4.

Mound 3 was situated 115 yards southeast of the painted wall, was almost circular at the base, pyramidal in shape, 62 yards in circumference, and 10 feet high at its highest point. By digging into this mound a wall running north and south was found about 2 feet below the surface. This wall, when exposed in its whole extent, was found to be 18 feet long, 16 inches thick, and built of roughly squared blocks of limestone held together by mortar, which was rotten and crumbling. The summit of the wall was irregular and varied in height from 4 to 7 feet; it extended to the ground level and stood upon a floor of hard cement. At its south end this wall was broken off short; at its north end it joined a wall running east and west, but this latter extended only 2 or 3 feet, and was then broken down. Neither inside nor outside were any traces of painted stucco to be found on either of these walls, nor, in the excavation of the mound, which was built of earth, limestone dust, and rough blocks of stone, were any stones found with traces of stucco adherent to them. There was no cornice on the wall. Numerous pieces of pottery were found in the mound, some rough and ill made, others painted red, black, yellow, and brown, and a few glazed.

Mound 4 was 86 yards in circumference, oval at the base, conical in shape, and 6 feet high at its highest point. Immediately beneath the surface a wall was found running east and west. It was very similar to the wall last described, being built of blocks of roughly squared limestone. It varied in height from 4 to 6 feet, rested on a floor of hard cement similar to that found in the last mound, was not covered with stucco either inside or out, and had been broken off short at both ends. The mound itself was composed of earth, limestone dust, and rough blocks of limestone. Numerous potsherds were found within it, both plain and painted. It was situated 195 yards almost due north of mound 3.

The two last-described ruins differed from the one covered with stucco in that they rested on the ground level, whereas the latter stood on a platform raised 2 feet above it.

MOUNDS CONTAINING POTTERY, IDOLS, AND ANIMAL EFFIGIES

Mounds of the second class, namely, those containing, superficially, the fragments of two pottery idols, and more deeply or on the ground level a number of small painted pottery animals, either within or immediately around a pottery urn, next claim our attention.

Three mounds of this kind were excavated at Santa Rita—2, 5, and 6 on the plan. Mound 2 was situated nearly 500 yards east of the large central mound; it was 30 yards long, 25 yards wide, 96 yards in circumference, and 18 feet high at its highest part. The northern face of the mound sloped gently down from the summit to

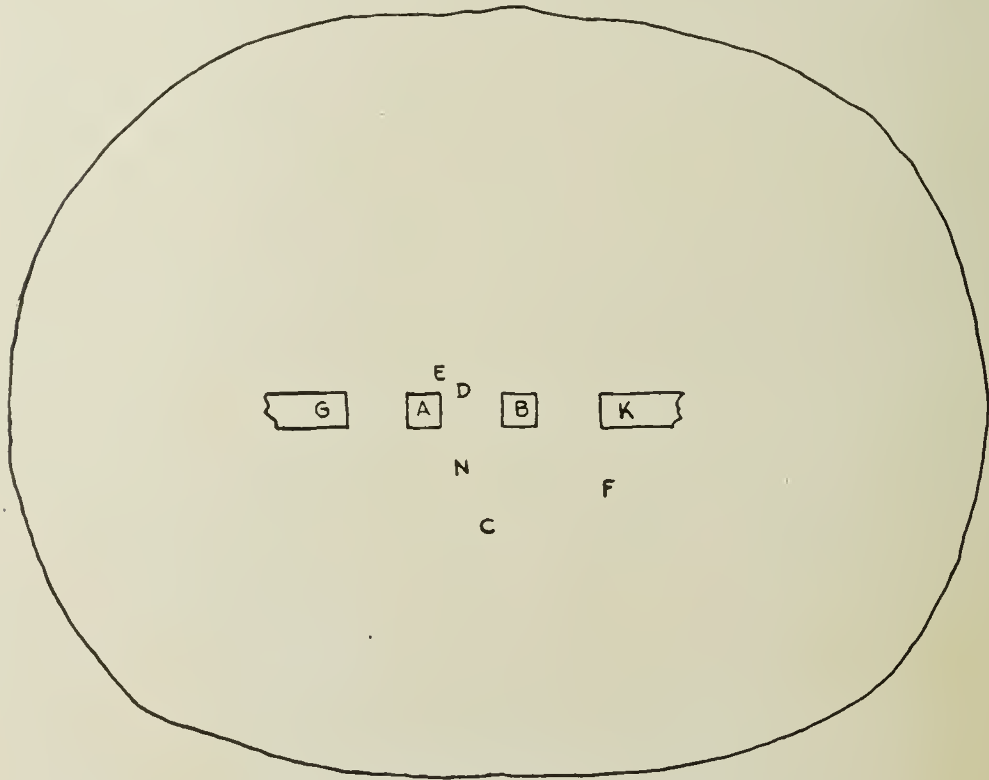

FIG. 6—Plan of mound 2, Santa Rita.

A, B, Pillars. G, K, Walls. E, Place where birds' bones were found. N, Circular chamber. D Place where idols were found. F, Place where cabbage-palm was found. C, Place where painted animals were found.

the base; the southern face was almost perpendicular. When the upper layer of the mound was removed it was found to consist of dark-brown loam with a few pieces of limestone embedded in it. At the bottom of this layer and resting on the one immediately beneath it were found fragments of two idols and a quantity of birds' bones, together with the inferior maxilla of a small rodent. The head of one of these idols (supposed by Mr Diesseldorf to be the conventional portrait of Cuculcan) is shown in figure 3, plate XXXII. The remarkable

HEADS OF IDOLS FROM MOUNDS 2, 5, AND 6, SANTA RITA

resemblance of the head which adorns its headdress to one found at Quirigua has already been noted. The rest of this idol and the whole of the one which was found with it are so badly broken as not to be worth figuring. The bones were those of the curassow, and, judging by the number of long leg bones which were found in good preservation, probably represented the remains of five or six birds. The bones were found at a point marked E on the plan of the mound (figure 6), close to the idols. With the idols were found a number of rough unpainted potsherds. Immediately beneath the loam the mound was covered with a flat, evenly applied layer of mortar, from 6 to 8 inches in thickness; it was soft and friable and contained in its substance numerous large pieces of limestone. The next layer was composed of limestone blocks, the interstices between which were filled with limestone dust. A large number of the stones were squared, and some retained pieces of painted stucco still adherent to them, having evidently at one time formed part of the south wall of the temple already described. Embedded in the top of this layer, at the point marked F in the plan, was found a piece of cabbage-palm stem 5 feet long, but so wormeaten and decayed that it was impossible to tell what its original use had been. Within this layer the broken tops of two square pillars, A and B in the plan, and of two walls, G and K, on either side of them, first appeared. These two pillars occupied a nearly central position in the mound; they were 3 feet square and were built of large blocks of nicely cut stone. The summits were uneven and had evidently been broken off; the distance between the pillars was 6 feet. The walls were in line with the pillars, placed on either side of them, at a distance of 6 feet from each; they were 3 feet thick, built of nicely squared blocks of limestone, and were broken off at the top and outer ends. The summits of these walls and pillars were at a depth of 2½ feet below the surface of the mound; they passed down through the next two layers—one of cement, one of blocks of limestone—and rested on the tough, thick cement layer which lay immediately over the foundation of the mound. They were 4 feet high and at one time evidently had formed part of the portico of a building with three wide entrances. Judging from the very large proportion of squared stones which were used in the construction of the upper layers of this mound, it would seem that the greater part of the stones of this building had been used in constructing the mound which covered its ruins. The next layer was of cement, 6 to 8 inches thick, and spread evenly over the mound, forming a table-like surface; the cement was rotten and friable. The layer immediately beneath this was composed of blocks of limestone, the majority of which were squared, and so tightly were they packed together with limestone dust that the mass was almost as difficult to dig into as if it had been masonry. In the lower part of this layer, 6 feet below the surface of the mound, at a point marked C in the plan, the pottery urn,

figure 7*b*, was discovered. This urn was 12 inches in height and 46 inches in circumference at its widest part; it was made of smooth, hard pottery, having a uniform thickness of three-sixteenths of an inch; it was unpainted and unglazed, was without a cover, and consequently was full of limestone dust. It rested on the layer of hard cement immediately underlying the layer in which it was buried. This urn, unlike the others, was not inclosed in a stone cyst, and was unfortunately much damaged by a blow of the pickax. Placed all around and above the urn, within 2 inches of it, were found 10 small painted pottery animals and two flint spear heads. The animals consisted of

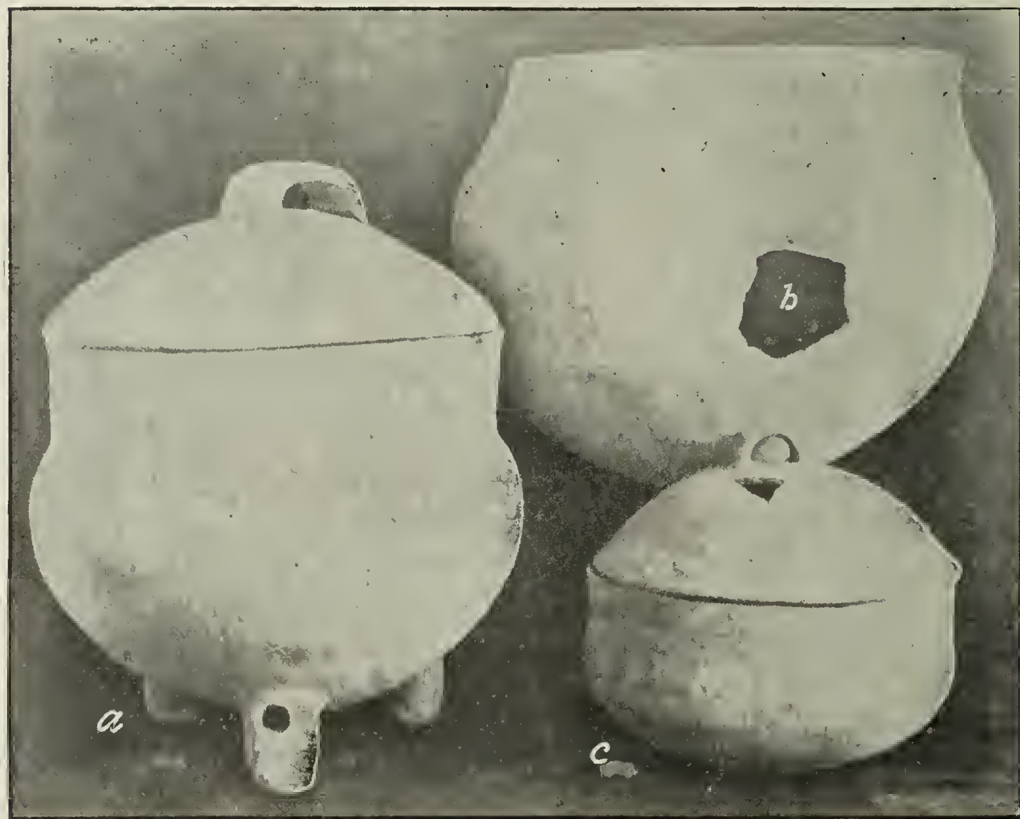

FIG. 7—Pottery urns from mounds 2, 5, and 6, Santa Rita.

four tigers, five turtles, and one double-headed animal, probably intended to represent an alligator. Two of the animals were placed at each of the four cardinal points around the urn and two above it. The tigers, of which one is represented in figure 6, plate XXXIV, are $4\frac{3}{4}$ inches in height, and are painted red all over. They are represented as sitting up on their hind legs, with their mouths open and tongues protruding. Each animal is hollow and has a small round hole in the center of the back communicating with the interior. One tiger was placed on either side of the urn. All were precisely alike in size and coloring. Of the turtles (see figure 6, plate XXXIII, and figure 1, plate XXXV) five were found. One was placed on either side of the urn

HUMAN AND ANIMAL EFFIGIES FROM MOUNDS 2, 5, AND 6, SANTA RITA

ANIMAL EFFIGIES AND IDOL'S HEAD FROM MOUNDS 2 AND 6, SANTA RITA

and one immediately above it. They vary in length from 5½ to 6½ inches. The bodies of two of them are colored red throughout, the other three are unpainted. The eyes of all are colored black, the eyebrows light blue outlined in black, and the nose red. At the forepart of the body on either side are two human hands and arms, the former tightly closed. The mouth is widely open, and from it protrudes a human head, which the animal is apparently in the act of swallowing. The face belonging to this head is colored light blue, the mouth and lips red, and the eyes and eyebrows black (see plate XXXV, 1). In the ears are large round earrings, which, having caught in the angle to the turtle's mouth on either side, are apparently giving him some difficulty in swallowing the head. The turtles are all hollow and are perforated in the center of the back by a round hole, 1 inch in diameter, which communicates with the interior. When the animals were found, this hole was covered with a small, pyramidal, earthenware stopper, which in plate XXXIII, 6, is seen in situ. The last animal (see plate XXXIII, 5) is 7½ inches in length, and has two heads, one at either end. The specimen shown in the plate was dug up in mound 6, presently to be described, but it is so like the one from mound 2, both in shape and in coloring, that one illustration serves for both. One head is certainly that of an alligator, as is apparent from the huge mouth, formidable teeth, and double row of projections running down the back. Within the widely opened jaws of the animal is seen a human face, the mouth, chin, and forehead of which, as well as the inside of the alligator's mouth, are irregularly smeared with red paint, evidently meant to represent blood. The body of this double-headed animal is unpainted, but is covered with small red spots sharply outlined in black. The other head possesses two eyes and a snout, together with a single row of large curved teeth running from the snout to the neck. There is no sign of a lower jaw. Placed on either side of each head is a human hand and arm having the wrists ornamented with a circle of small, round disks of pottery, colored red. The body is hollow, and midway between the two heads, on its dorsal surface, is a small round hole, communicating with the interior, and covered with a pyramidal stopper, seen in situ in the figure. Within the cavity of the body were found three small oval beads, two of jade and one of some orange-red stone, all nicely polished; a very small obsidian core, 1½ inches in length and about the thickness of a pencil; and a small flat chip of grayish chert. This animal, together with one of the turtles, was placed above the urn. The two spearheads are leaf-shape and are 4 and 3 inches in length, respectively. Both are nicely chipped from yellowish flint, the smaller of the two being grooved on either side at the base, probably for greater security in hafting.

The layer immediately below that which contained these animals was composed of very tough cement and covered the whole mound evenly. It was so hard that even with a pickax it was difficult to make any impression on it. It was 12 inches thick and of a light yellowish color. Upon it rested the two pillars and fragments of walls already referred to, together with the pottery urn.

Below this cement layer and reaching to the ground level the mound was built of large blocks of limestone, rough and unhewn, but neatly fitted together without any mortar or earth between them. Not one of these blocks was worked or showed traces of stucco. Extending downward from the cement layer to the ground level through this last layer was a small circular cyst at the point marked N on the plan. Its upper opening was covered with a slab, over which the cement was continuous. Its floor was the ground, and its sides, though neatly built, were not plastered. It was 3 feet in diameter and contained nothing but a quantity of charcoal.

It seems evident that before this mound was erected there stood on its site a building, of which part of the north wall is now all that remains. This building was erected on a solid stone platform, raised 10 feet above the ground level, and covered with a thick layer of very hard cement. The mound was constructed partly from the stones taken from this building and partly from those of the temple before described.

The urn, the painted animals, the idols, and the bones were placed within the mound at the time the building was destroyed and the upper part of the mound erected over its ruins; the urn and the animals on what had been the floor of the building, the idols and the bones more superficially in the mound. The original stone platform on which the building had stood formed the base of the mound.

The second of these animal mounds, 5 on the plan, was situated 345 yards almost due north of the great central mound. It was 52 yards in circumference, oval at the base, conical in shape, and 5 feet high at its highest point. It was built of earth and limestone dust, together with rough blocks of limestone, none of which were squared or showed any traces of stucco adherent to them. Almost in the center of the mound, a little less than 1 foot below the surface, fragments of two clay idols were discovered, consisting of arms, legs, and portions of two bodies. The face shown in figure 1, plate XXXII, is that of one of the idols. The other head and the remaining pieces are so much damaged that they are not worth figuring. On reaching the ground level, directly in the center of the mound, a small stone cyst or chamber was discovered. It was 18 inches in length, 12 inches in breadth, and 12 inches in height. The floor was the ground; the roof and walls were made of single, roughly hewn, flat slabs of stone. Within this cyst appeared the small pottery urn shown in figure 7 *c*.

1

2

ANIMAL EFFIGIES FROM MOUNDS 2 AND 6, SANTA RITA
NATURAL SIZE

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This urn is 5 inches in height and 27½ inches in circumference at its widest part, and is made of unpainted, unglazed pottery, one-eighth inch in thickness throughout. It is covered by a mushroom-shape lid with a small semicircular handle. Unfortunately, in lifting the flat stone which formed the roof of the cyst the point of the pickax was driven through the lid. Within this small urn lay the double-headed alligator shown in figure 1, plate XXXIII. This animal is 8½ inches long from the tip of one snout to the tip of the other. Protruding from the widely opened jaws of each of the heads appears a human face. The mouth of each of these faces is decorated with two small circular lip ornaments, one attached to each of its angles, all exactly similar to those seen on the mouth of the idol shown in plate XXXII, 2. The faces where they are in contact with the animal's jaws, and the jaws themselves, are daubed with red paint to represent blood; other parts of the faces and the whole of the body and the heads of the animal are painted dark green.

The third and last mound of this kind, 6 in the plan, was situated 933 yards southwest of the large central mound. It was the smallest of the three, and was circular at the base, conical in shape, 30 feet in diameter, 32 yards in circumference, and 5 feet high at its summit. Nearly 2 feet below the surface, toward the center of the mound, a large quantity of very rude, ill-made pottery was discovered, together with the fragments of two pottery idols. One of these is by far the finest and most perfect found in any of the mounds. It is 16½ inches in height from the top of the headdress to the sole of the sandal, and is shown in figure 2, plate XXXII. The left arm was also found, but has not been joined on in the figure. The pieces were not all together, but were spread about over an area of two square yards. The other idol was so fragmentary that it was not worth figuring; but the lower half of the face, as it differed from all the rest in possessing a beard and mustache, is shown in figure 2, plate XXXIV. Two small, oval, clay beads were found with the idols.

This mound was composed throughout of earth and large, rough blocks of limestone. Within 50 yards of it is an excavation of some size, from which the material to construct it was probably obtained. When the ground level was reached a small stone cyst built of roughly hewn slabs appeared. It was 2 feet long, 2 feet broad, and 18 inches high. When the stone slab which formed the roof was removed the urn shown in figure 7*a* was found. This urn was circular in shape, 11½ inches high, and 37 inches in circumference at its widest part, and stood on three long, round, hollow legs. It was of unpainted pottery three-sixteenths inch thick throughout, and was covered by a mushroom-shape lid with a semicircular handle. When the lid was removed 19 small objects were found within the urn, completely filling it. Of these, 13 represent animals, 1 a fish, and 4 human figures, while 1 is

a small circular jar, decorated outside with a human figure supporting itself on its forearms, the legs being held up in the air. Of the animals, 4 are tigers, 1 of which is shown in plate XXXIII, 4, and in plate XXXVI. Each is 4½ inches in height. The body is colored white and covered with red spots encircled with black. The head is red, the ears white, and the eyes black. Each has a collar of small, oblong pieces of pottery colored alternately green, white, and red. The male genital organs are prominently represented, as the animals are sitting up on their hind legs. Each figure is hollow, and is perforated at the back by a small round opening. There are 9 alligator-like animals, 1 of which has already been described, as it is the exact counterpart of the one found in mound 2.[1] Others are shown in figures 3, 4, 5, and 7 of plate XXXIV, and in plate XXXV, 2. Four of the 9 resemble figure 5, and are evidently intended to represent alligators, judging by the shape of the body and legs, the spines on the tail, and the double row of excrescences extending along the center of the head and back. They vary from 5½ to 7 inches in length. The bodies of two of them are colored red, and of two, white; the eyes and spines of all are colored black. A black streak passes around the jaws, and the forefeet are divided into three toes by thin black lines. The bodies are all hollow, with a circular opening in the center of the back covered by a pyramidal stopper, seen in situ in the figure. Figures 3 and 4, plate XXXIV, are not unlike the preceding, but they have the curious curved ornaments before noticed both above and below the eyes. The tails are bifid, and the figures possess a horn-like excrescence attached to the tip of the nose. The double row of tubercles extending along the head and back is wanting. Figure 7 and plate XXXV, 2, differ from figures 3 and 4 in possessing a pair of lateral, fin-like limbs instead of four legs, and figure 7 has a single, triangular dorsal fin placed in the center of the back. The hole communicating with the interior is at the side, to allow for the dorsal fin, and there is no stopper covering it. The bodies of two of the last four animals are red, and of two, white. The ornaments above the eyes are painted light green, outlined in red. Figure 1, plate XXXIV, is probably intended to represent a shark. The body, which is 7 inches long, was first painted white and afterward red, but most of the paint has worn off. Figure 3, plate XXXIII, shows a small round pot, 3 inches in height, to the outside of which is attached a human figure supporting itself on its forearms while its legs are held up in the air above the head. On the head is worn the usual enormous feather-decorated headdress, and around the forehead, wrists, and ankles are bands of small round pottery disks. The face

[1] There can be little doubt that this animal, together with its duplicate, also the double-headed alligator, and the turtles, are all intended to represent the Aztec Cipactli, a mythic animal at times taking the form of a swordfish, a shark, an alligator, and an iguana; it symbolizes the earth, and, as in the above cases, is often represented with a human head between the jaws to signify that all flesh returns to its original earth, and to death.

1

2

TIGER EFFIGY FROM MOUND 6, SANTA RITA
NATURAL SIZE

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1

2

HUMAN EFFIGY FROM MOUND 6, SANTA RITA
NATURAL SIZE

A. HOEN & CO. BALTIMORE

is colored blue, the mouth red, the eyes white, and the eyebrows black. This ornament of a human figure supporting itself on the forearms while the legs are held above the head is not an uncommon one, as I have two vases similarly ornamented, one found in a mound on the Chetumal bay, the other in a mound near Rio Hondo. It is also seen as a bas-relief on stone over a doorway at Tulum, on the coast of Yucatan, and is scratched on the stucco among a number of other figures at Mount Molony, on the borders of Guatemala and British Honduras. The last of the contents of the urn is shown in figure 2, plate XXXIII. There were four of these figures, all precisely alike. Each is 4¾ inches in height, and represents a man in a squatting position, holding in front of him, with both hands, a veil, which conceals him from forehead to feet. The body is colored white and the arms red. Across the forehead is a red stripe, and the veil is colored with alternate red and white vertical bands. The headdress differs from that usually associated with the ancient inhabitants of Central America and reminds one somewhat of representations of the ancient Egyptian headdress.

No human bones were found associated with any of these animals, and it seems probable, judging from the excellent state of preservation in which the birds' bones taken from mound 6 were found, that had there been a human interment, some trace of it would have been discovered. Mounds 5 and 6 were evidently built for the special purpose of containing the idols, urns, and animals which were found within them. In mound 2, on the other hand, the objects were placed on a preexisting platform which had supported a building, and were covered by a capping of earth and stones, the latter taken mostly from the building. All the animals appear to symbolize death and destructiveness. The tiger, the alligator, and the shark must have been, in the bush, the river, and the sea, respectively, the most destructive animals known to the aboriginal inhabitants; and in the one exceptional case of the turtle, which might be looked upon as a comparatively harmless animal, it is represented in the act of devouring a human being.

A LOOKOUT MOUND

Turning to the third class of mounds, we will take first the large central mound, 7, around which the others appear to be grouped. It is circular at the base, conical in shape, 57 feet in height, 471 feet in circumference, and is built of blocks of limestone held together with mortar. Indeed, so hard is it all over that the idea of excavating it had to be given up. On the south side of this mound, and, continous with it, is a circular earthwork 100 yards in diameter. The walls inclosing the circular space vary from 10 to 25 feet in height. They are higher toward the north, where they are continuous with the large mound, and lower toward the south, where an opening 30 feet wide

gives access to the inclosure. About 20 yards south of this opening is a small mound 4 or 5 feet in height. In the center of the space, inclosed by the earth walls, stands a small mound 3 feet in height and 40 feet in circumference. Excavations were made in the earth wall, in the space inclosed by it, and in the small mound in the center of the space. Nothing, however, was found except a few potsherds such as may be found by digging almost anywhere on the estate. The walls were found to be built of earth and limestone blocks. Immediately to the north of the mound is a huge excavation, from which limestone has been quarried. There can be little doubt that this was the source whence material to build both walls and mound was drawn. This large mound and the inclosed space adjoining probably formed together a lookout station and a fort. The mound itself is one of a series, all of which possess certain characteristics, marking them as lookout or signal mounds. They are all more than 50 feet in height, and have a flat, table-like surface at the top, a comparatively small base, and consequently very steep sides. They are always surrounded by a number of smaller mounds of various sizes and uses, which probably indicate the site of ancient populous centers; and they are usually, though not invariably, associated with an earthwork fortification, either actually joined to them, as at Santa Rita, or at some little distance away, as at Adventura, the next mound of the kind in the series, which will be described at another time. Such of these mounds as have been opened have not contained pottery or stone objects, or anything to show that they had been used as sepulchers. As has been proved by experiment, a large fire lighted on the flat surface at the top of any one of these mounds can be seen plainly over the intervening bush—the country being perfectly flat—either by the smoke during the day, or by the flame during the night, from the top of the mound on either side of it in the chain. Beginning at the top of Chetumal bay, these mounds extend in a chain for nearly 150 miles, first following the coast line, then trending inland in a southwesterly direction. The intervals between them are in no case greater than 12 miles or less than 6 miles. Each of the mounds forming part of such an extended chain, along which it was easy to convey intelligence either by day or by night, standing also in the center of the town or village and adjacent to a fortified position into which the inhabitants could retire, would form a most useful signal station from which to observe and communicate the approach of an enemy, either by sea or land; and there can, I think, be little doubt that this was the use for which they were designed.

A SEPULCHER MOUND.

At a distance of 691 yards almost due east of the large central mound was situated the mound marked 9 in the plan. This was the only mound excavated on the whole estate which had unquestionably

GREAT CENTRAL LOOKOUT MOUND (7) AT SANTA RITA, WITH EARTHWORK

been used solely for sepulchral purposes. It was one of the smallest mounds explored, being only 15 yards in circumference and 3½ feet in height at its highest point. It was nearly circular at the base and flat on top, and was built of earth and rough blocks of limestone. Nearly in the center of the mound, at the ground level, a human skeleton was discovered, the head pointing toward the north. The bones were so brittle that in the attempt to remove them they were very much damaged. The skull was full of earth, and, while being lifted out, it collapsed into numberless pieces from its own weight and that of the earth which it contained. The fragments of the bones were removed, and, after exposure to the air for a few days, they hardened considerably and could be handled without injury to them. The bones were apparently those of a male of from 5 feet 4 inches to 5 feet 6 inches in height. Lying by the side of the skeleton were a conch shell with the apex broken smoothly off, as if it had been used as a trumpet, numerous broken pieces of conch shells, a roughly chipped flint spearhead 4½ inches in length, and an oval flint hammer stone. Associated with these two latter implements were four sharp-pointed conical pieces of shell, the ends of which had evidently been ground to a point as if for use as boring implements. They were manufactured from the whorls in the interior of conch shells. The contents of this mound appear so unlike to the contents of the other mounds at Santa Rita that one can not help thinking that it belongs either to a different people or a different period. This supposition is rendered more probable by the fact that along the shores of the Chetumal bay, a few miles from Santa Rita, the sea is rapidly encroaching and exposing interments very similar to the one described, except that in most cases no mound marks the position of the grave. The sharp shell implements are invariably to be found in these graves, together with pottery and flint implements, all exceedingly rude and archaic.

UNCLASSIFIED MOUNDS

Three hundred and ninety yards to the northwest of the large central mound was situated the mound marked 8 in the plan. This mound was roughly circular, flat on the top, 90 yards in circumference, and 5 feet high at its highest part. I was informed by some of the old laborers on the estate that some years previously, while stones were being dug from this mound for the purpose of erecting a tank, a number of what they described as large stone idols had been discovered. Of these I was, unfortunately, unable to discover the subsequent history; but there can be little doubt that, together with the other stones, they were squared for building purposes. This is rendered more probable by the fact that in examining a well close at hand, which had been built at that time, I discovered a large stone tiger's head projecting inward from the masonry, into which it had been built. As, however, the whole mound had not been dug down I set to work excavating that

portion of it which was left. It was composed of earth and blocks of limestone. At a depth of about 2 feet below the surface were found (1) a large tiger's head cut in stone; (2) a turtle cut in stone and colored; (3) the lower part of a human mask; (4) a small, smooth, globular piece of jade. Potsherds, both painted and plain, were found in large quantities at all depths throughout the mound.

The tiger's head, which measured 18 inches from the forehead to the tip of the protruded tongue, evidently at one time formed a gargoyle-like ornament on some building, as behind the head the stone from which it was cut had been squared for a distance of 14 inches, obviously for the purpose of being built into masonry. The head is, as is well shown in plate XXXIX, much weathered, the soft limestone being eaten away to such an extent that at first sight it is difficult to determine what it is meant to represent.

If this head be compared with the tiger, figure 4, plate XXXIII, it will be seen that, in the shape of the head, contour of the face, protruding, pendant tongue, prominent round eyes, and square upper incisor teeth, the resemblance is sufficiently strong to warrant the assumption that both are products of the same race, if not of the same artist. The turtle is 18 inches in length by 12 inches in breadth, and is nicely cut from a single block of limestone. It is an exact copy of the turtle shown in figure 6, plate XXXIII, excepting that the mouth, instead of containing a human head, is closed. The whole animal is painted red, and in the center of the back is a round hole leading to a considerable cavity which has been hollowed out in the interior. The hole is covered by a circular disk of limestone 3 inches in diameter. The human mask is made of rough pottery. The upper part of the face is missing; it is 3½ inches from ear to ear; the mouth is puckered up into a small, round hole as if in the act of whistling.

The mound marked 10 on the plan was 98 yards in circumference, and very flat, nowhere exceeding 3½ feet in height. It was constructed throughout of small pieces of limestone mixed with clay, and contained an enormous quantity of potsherds. These were for the most part rough and ill-made, but a few were painted and glazed. Nothing further was found in the mound till the ground level was reached, when an equilateral triangle, built of stone, was disclosed. Each side of the triangle was 18 feet in length, and was composed of roughly cut slabs of stone stuck upright in the ground and in contact on either side with similar slabs. The sides of the triangle varied in height from 8 to 18 inches. The upper edges were irregular, the lower sunk to a depth of 5 or 6 inches in the ground. The stones were removed and the earth dug up, both in the center and along the sides of the triangle, but nothing whatever was discovered.

The mound marked 11 on the plan was situated 1,130 yards southwest of the large central mound. As, in all the former mounds which had been excavated, whatever of interest they had contained

had been found at or near the center, an excavation 14 feet by 7 feet was first made in the center of this mound down to the ground level. For the first 3 feet the mound was composed of very small stones and earth. Beneath these was a layer of rough blocks of limestone and limestone dust reaching to the ground level. At a depth of about 4 feet a smooth, oval, flattened stone 5 inches in length was found, the marks on which showed that it had been used as a whetstone. With the exception of potsherds, nothing else was found in this excavation, which was afterward enlarged on all sides, but with a similar result, nothing whatever but stones and earth being found.

The mounds 12, 13, 14, 15, and 16 in the plan lay in a group to the northeast of the large central mound, and within 200 yards of it. They were all circular at the base and roughly conical, and were all nearly of the same size, varying from 30 to 35 yards in circumference and from 4 to 6 feet in height. In contents and construction they all proved so much alike that a description of one will suffice for all. The two upper feet consisted of earth, with a few blocks of limestone; beneath this, to the ground level, the mound was built of limestone blocks, the interstices between which were filled in with limestone dust. A few potsherds were found, for the most part rough and unpainted. At a depth varying from 2 to 3 feet, or about midway between the summit of the mound and the ground level in each case, a small stone cyst was found, 18 inches square, the walls, roof, and floor each composed of a single slab of roughly cut stone. These cysts were in all cases perfectly empty, and were placed as nearly as possible in the center of the mound. Nothing further was found in any of the mounds.

The mound marked 17 on the plan stood 500 yards almost due east of the large central mound. It was oval in shape, flattened on the top, 85 yards in circumference, and 6 feet high at its highest point. The northern face was almost perpendicular; the southern sloped gradually to the ground level. The upper two feet consisted of earth and blocks of limestone. Near the center of the mound, at a depth of 1 foot, were found the fragments of two idols very similar to those found in mounds 2, 5, and 6. Close to these were found: (1) The flat, triangular head of a serpent, with protruding, forked tongue; this was made of pottery, and had been broken off from the body; (2) a small, pyramidal pottery stopper, like those placed over the openings in the pottery animals; (3) a dragon's head in pottery, with an elaborately decorated headdress; (4) a small pottery mold, 4 inches in height, for making masks. After first oiling the inside of it, I filled this mold with plaster of paris, and it turned out a face very like figure 3, plate XXXII, but without the headdress. Beneath the layer of earth and limestone came a layer of limestone blocks, many of which were squared. This was the last mound opened, and as in mounds of similar construction in which two broken idols had been

found superficially, an urn with pottery animals had invariably been found on digging deeper, I felt almost certain that here, also, they would be discovered toward the center of the mound. But though an excavation 15 by 8 feet was made through the center down to the ground level, nothing further was brought to light.

UNEXCAVATED MOUNDS

Turning next to those mounds at Santa Rita which have not as yet been excavated, we find that the first of these, 18 on the plan, is by far the largest mound on the estate, and is indeed the largest mound that I have seen in the colony. It is situated 100 yards almost due south of the large central mound, is 412 yards in circumference, oval in shape, flat on the top, and 10 feet high. This mound has never been dug into.

Mound 19 is very similar to the last and is in line with it and the large central mound. It is 10 feet high at its highest part, roughly circular at the base, and 270 yards in circumference.

Mound 20 on the plan is situated 400 yards southwest of the large central mound. It resembles in shape the two preceding mounds, but is much the smallest and lowest of the three, being 83 yards in circumference, flat at the top, circular at the base, and 3½ feet high at its highest point.

These three mounds have been described as being typical of a class of mound which is numerous in the bush all round the estate and throughout the whole of the northern district of the colony. Mounds 18 and 20 exhibit the greatest variation in size and height found among this class, all the members of which are intermediate in size between these two. I have opened only one of these mounds as yet, but as nothing was discovered inside except potsherds, I was not much encouraged to proceed with the excavation of the others.

Mound 21 is situated about 1,000 yards southwest of the large central mound. It is almost semicircular in shape, and is 30 yards in length, measured along the curve. The east end is much broader and higher than the west: the mound, in fact, resembles the half of a pear, in which the stem has been bent round through a semicircle toward the head. The mound is 5 feet high and 24 feet broad at its head, and gradually lessens till it is only 3 feet high and 8 feet broad at its tail. The convexity faces north, the concavity south. At the point marked 22 on the plan there are several of these mounds very like the one just described, both in shape and size. A number of similarly shaped mounds are found in the bush surrounding the estate, and in other parts of the district they are common. At Sateneja, a village on the coast about 20 miles from Santa Rita, a large number of these mounds of various sizes are so arranged as nearly to inclose a roughly

STONE TIGER HEAD FROM MOUND 8, SANTA RITA

circular space very near the seashore. Their concavities all face toward the space which they inclose; their convexities face outward, and they were obviously constructed for defensive purposes. Occasionally these mounds are almost circular, the narrow pointed end being produced onward till it passes the broad end, leaving a space 2 or 3 yards across between them as an exit or entrance.

These mounds vary in length along the curve from 30 to 100 yards, and in height from 2 to 15 feet. I have opened several of them in various places, but never found anything in them, which fact strengthens the presumption in favor of their being used solely for defensive purposes. Some of those at Sateneja contained a large number of conch shells; but these shellfish are very plentiful along the coast, and when the fish had been extracted the accumulated shells were probably used, merely in place of stones, to build up the mound.

Mound 23 on the plan, situated 217 yards southwest of the large central mound, resembles the latter very closely. It consists of two portions—a large mound, and to the south of this a circular space inclosed by earthen walls, through which is an opening to the south. This mound is 25 feet in height, conical in shape, circular at the base, and slightly over 400 feet in circumference. The walls of the earthwork are continued into it on its south side. Unlike the large central mound, it is loosely built of earth and stone. The walls of the circular earthwork where they join the mound are 12 feet high, but as they approach the opening they become gradually lower. The circular space included within the walls is 80 yards in diameter.

UNDERGROUND ROCK-HEWN RESERVOIRS

Scattered about irregularly among these mounds and in the adjacent bush are a number of circular openings in the ground, leading to small oval chambers hollowed out in the limestone rock. Into some of these chambers it is quite easy to descend, but others have become blocked up, either from the roof caving in or from débris falling through the opening and obstructing it. Those that I have examined are precisely alike in construction and shape, differing only in size, and a description of one, which is situated within a few yards of the mound marked 3 in the plan, will serve for all.

The upper opening is 3 feet in diameter; that part of it which passes through the surface earth is built round with blocks of limestone. Three feet below the surface the opening terminates in the first step of a half-spiral staircase cut in the limestone, which leads to the floor of the chamber. The chamber itself is 18 feet long by 10 feet broad; the roof is arched, the highest part being just below the entrance; the opposite end is so low that it can not be reached without crawling on the hands and knees. The floor is slightly concave, giving the whole

somewhat an egg-shape appearance. It has been covered throughout with a layer of hard plaster, but a good deal of this has peeled off and is lying about on the floor. Nothing whatever was found in any of these chambers except the earth and rubbish which had fallen in through the opening. I have found eight of these chambers within an area of about 1 square mile around the mounds, and doubtless many more exist, concealed by the bush. I first discovered chambers of this kind in the western district of British Honduras, but I did not then think that they had been used as reservoirs for water, as several existed close to the Mopan river, where excellent drinking water could be obtained even in the driest season, and in one case a chamber of this kind had been used as a sepulcher.

Stephens, in his book on Yucatan,[1] mentions these chambers, of which he came across several near Uxmal. He was of the opinion that they had been used as reservoirs for water in the dry season, and I am now also of this opinion, as it would have been impossible for the builders of the mounds and buildings at Santa Rita to have brought their fresh water from the nearest natural supply, which is the Rio Nuevo, situated at a distance of 5 miles from the estate, from which it is separated by an almost impassable swamp. Nor could wells have supplied the aboriginal inhabitants with water, for not only have no traces of any been discovered, but wells which have been sunk on the estate in recent years have reached water so brackish that it is quite unfit for human consumption.

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[1] John L. Stephens, Incidents of Travel in Yucatan, vol. I, p. 232.

MAYAN CALENDAR SYSTEMS

BY

CYRUS THOMAS

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MAYAN CALENDAR SYSTEMS.

By Cyrus Thomas

PREFATORY NOTES

The recent explorations in Central America and southern Mexico by Maudslay, Holmes, the Peabody Museum, and others have brought to light so much new material that a modification in some respects of conclusions based on the data previously obtained is required. It is expedient, therefore, to bring conclusions and deductions into harmony with the new data. At present, however, attention will be limited to an examination and discussion of the inscriptions and the Dresden codex in the light of this additional material and of the recent discoveries in regard thereto.

That progress toward the ultimate and correct interpretation of these inscriptions and of the codices and symbolic figures will be slow is well understood, and that more or less modification of previous views will follow as the result of new discoveries is to be expected. This fact is well illustrated in the Old World in the efforts of archæologists and linguists to reach a positive and satisfactory conclusion in regard to the so-called Hittite remains.

The most important material for the object of this paper, relating to the inscriptions, is found in the data obtained by Mr Maudslay during his explorations of the ruins of Copan, Quirigua, Tikal, and Palenque. Although the ruins of the last-named place have been described and figured again and again, it was not until Mr Maudslay's clear and large photographs of the inscriptions were published that the data relating thereto—save that on the slab in U. S. National Museum—were in a condition to be satisfactorily studied by those interested in the subject. New light has also been thrown on the inscriptions by certain discoveries made by Mr J. T. Goodman and Dr E. Förstemann in regard to the signification of some of the glyphs.

The positive results so far obtained by attempts to explain the inscriptions and codices, including those obtained by Mr Goodman and Dr Förstemann, relate almost wholly to the time and numeral symbols. In his elaborate and important memoir, Mr Goodman

announces certain discoveries in regard to the signification and use of characters in the inscriptions, which, if verified, will materially modify previous opinions in regard thereto and will bear on future attempts at interpretation of the inscriptions; he also announces other discoveries tending to show that the opinions hitherto held in regard to the Maya time system are erroneous in many respects; and since these announcements form part of Mr Maudslay's great work, Biologia Centrali-Americana, a review of the entire subject would seem timely.

The present paper will be limited to an examination of the time and numeral symbols, time counts and time systems of the Mayan tribes, as indicated by the codices and inscriptions, and will avoid, so far as is possible, rediscussion of points considered as satisfactorily settled previous to the appearance of Mr Goodman's memoir entitled The Archaic Maya Inscriptions (1897). The discussion will be based on a personal examination of the Dresden codex and the inscriptions, the former in Dr Förstemann's photographic reproduction and the latter chiefly in the magnificent photographic (autotype) reproductions by A. P. Maudslay in the archæologic portion of his Biologia Centrali-Americana; but the actual examinations have extended to all the more important Mayan inscriptions in the U. S. National Museum, the Peabody Museum in Cambridge, the collection of the American Antiquarian Society in Worcester, the American Museum of Natural History in New York, and the Museum of Archæology connected with the University of Pennsylvania in Philadelphia.[1] The discussion will be conducted in the light of the recent discoveries, some of which will, as we proceed, appear to be valid and of great importance in the study of Central American paleography. As one object in view will be to test Mr Goodman's interpretations, his work will be used in analyzing the symbols of the inscriptions and the time systems of the Mayan tribes as a basis of comparison in regard to the several points of which it treats. I shall therefore have very frequent occasions to refer to it, not in the spirit of criticism, but simply in behalf of scientific accuracy, as well as of other workers, differing from him where I believe he is wrong and agreeing with him where I believe he is right. The mode of examination will be, so far as possible, by inspection of the glyphs and mathematical demonstration by means of the numeral symbols.

In addition to the objects mentioned as in view in preparing this paper, it is expected that the comparisons and examinations to be made will show to some degree how far the glyphs found at Copan, Tikal, and Palenque, used as time and numeral symbols, agree as to form and signification, and how far they agree in these respects with the characters of the Dresden codex; and will also show whether or

[1] Grateful acknowledgments are made to the officers of these institutions for courteous assistance.

not the same time or calendar system was used in all, and in what respect the system presented by Mr Goodman differs from that generally understood and set forth by other writers—for if he is right in apprehending that previous investigators have been at fault in regard to the Mayan time system, it is important, in view of future investigations, that this be clearly shown and the error be pointed out. A comparison of the time systems of the Maya, Nahuatl, and Zapotec tribes has been made to some extent from the historic standpoint. This comparison indicates that the time systems used by these tribes were substantially the same.

As attention will be given almost exclusively to the examination of the time series and time systems of the codices and inscriptions, it is necessary, in order that the reader may follow closely and apply the tests himself, that the apparatus to be used be placed before him. This will involve some repetition of what has been given in my previous papers; but in order to use Mr Goodman's discoveries in comparisons it is necessary to adopt some scheme of applying them which can be introduced here, as his tables cover more than 100 large quarto pages. This, I have found, can be done, after a little study and practice, by means of two or three short tables, each occupying less than a page. They are therefore inserted with such explanations as are necessary to show how they are to be used. One of these tables which will be used in making comparisons is that numbered 3, on page 21 of my Maya Year, and entitled there "Days and Months of the four Series of Years." It is inserted here as table 1.

TABLE 1—*Days and months of the four series of years*

Akbal year	Lamat year	Ben year	Ezanab year														Days of month
Akbal	Lamat	Ben	Ezanab	1	8	2	9	3	10	4	11	5	12	6	13	7	1
Kan	Muluc	Ix	Cauac	2	9	3	10	4	11	5	12	6	13	7	1	8	2
Chicchan	Oc	Men	Ahau	3	10	4	11	5	12	6	13	7	1	8	2	9	3
Cimi	Chuen	Cib	Imix	4	11	5	12	6	13	7	1	8	2	9	3	10	4
Manik	Eb	Caban	Ik	5	12	6	13	7	1	8	2	9	3	10	4	11	5
Lamat	Ben	Ezanab	Akbal	6	13	7	1	8	2	9	3	10	4	11	5	12	6
Muluc	Ix	Cauac	Kan	7	1	8	2	9	3	10	4	11	5	12	6	13	7
Oc	Men	Ahau	Chicchan	8	2	9	3	10	4	11	5	12	6	13	7	1	8
Chuen	Cib	Imix	Cimi	9	3	10	4	11	5	12	6	13	7	1	8	2	9
Eb	Caban	Ik	Manik	10	4	11	5	12	6	13	7	1	8	2	9	3	10
Ben	Ezanab	Akbal	Lamat	11	5	12	6	13	7	1	8	2	9	3	10	4	11
Ix	Cauac	Kan	Muluc	12	6	13	7	1	8	2	9	3	10	4	11	5	12
Men	Ahau	Chicchan	Oc	13	7	1	8	2	9	3	10	4	11	5	12	6	13
Cib	Imix	Cimi	Chuen	1	8	2	9	3	10	4	11	5	12	6	13	7	14
Caban	Ik	Manik	Eb	2	9	3	10	4	11	5	12	6	13	7	1	8	15
Ezanab	Akbal	Lamat	Ben	3	10	4	11	5	12	6	13	7	1	8	2	9	16
Cauac	Kan	Muluc	Ix	4	11	5	12	6	13	7	1	8	2	9	3	10	17
Ahau	Chicchan	Oc	Men	5	12	6	13	7	1	8	2	9	3	10	4	11	18
Imix	Cimi	Chuen	Cib	6	13	7	1	8	2	9	3	10	4	11	5	12	19
Ik	Manik	Eb	Caban	7	1	8	2	9	3	10	4	11	5	12	6	13	20

Each month consisted of 20 days, each day having its particular name, as follows: Akbal, Kan, Chicchan, Cimi, Manik, Lamat, Muluc, Oc, Chuen, Eb, Ben, Ix, Men, Cib, Caban, Ezanab, Cauac, Ahau, Imix, Ik. The order or sequence here given was always maintained, though the month did not always begin with the same day, since, according to the peculiar arrangement of the calendar, as used in the Dresden codex and the inscriptions,[1] it might begin with (and only with) Akbal, Lamat, Ben, and Ezanab, as is shown in table 1. If it began with Akbal the second day would be Kan, the others following in the order given; if with Lamat, then Muluc would be the second, and so on; if with Ben, Ix would be the second, Men the third, and so on to Eb, the last; if with Ezanab, Cauac, Ahau, etc., would follow, always in the order given. The first day of the year would therefore necessarily be the first day of the months during that year. As the year was divided into eighteen months of twenty days each (always named and arranged in the following order:

1 Pop	7 Yaxkin	13 Mac
2 Uo	8 Mol	14 Kankin
3 Zip	9 Chen	15 Muan
4 Tzoz (or Zotz)	10 Yax	16 Pax
5 Tzec	11 Zac	17 Kayab
6 Xul	12 Ceh	18 Cumhu),

making 360 days, and five days to make the 365 were added at th end of the 18th month (Cumhu), the names following in proper orde1 it follows as a necessary result that the count in the day series would be thrown forward five days each year. If the year (or month) began with Akbal, the last day of the 18th month would be Ik; counting five days—Akbal, Kan, Chicchan, Cimi, and Manik—would bring us to Lamat, the first day of the next year.

The numbering of the days was peculiar; it did not correspond with the days of the month as we count them, but was limited to 13, followed by 1, 2, etc, up to 13, this order proceeding without variation, thus:

1 Akbal	6 Lamat	11 Ben	3 Ezanab
2 Kan	7 Muluc	12 Ix	4 Cauac
3 Chicchan	8 Oc	13 Men	5 Ahau
4 Cimi	9 Chuen	1 Cib	6 Imix
5 Manik	10 Eb	2 Caban	7 Ik

If the list continued 8 Akbal, 9 Kan, 10 Chicchan, etc., would follow. Hence, it is readily seen that by continuing the series each day name would in the course of time have all the thirteen numerals

[1] It is possible that the inscriptions of the Yucatan peninsula will be found to follow the system of the Troano and Cortesian codices and the codex used by Landa, should any inscribed dates be found.

attached to it. The round is completed in 13 months, as will be seen by table 2.

TABLE 2—*The months, days, and numerals for the year 1 Akbal*

Months	Pop	Uo	Zip	Tzoz	Tzec	Xul	Yaxkin	Mol	Chen	Yax	Zac	Ceh	Mac	Kankin	Muan	Pax	Kayab	Cumhu	Uayeb
Days	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Akbal	1	8	2	9	3	10	4	11	5	12	6	13	7	1	8	2	9	3	10
Kan	2	9	3	10	4	11	5	12	6	13	7	1	8	2	9	3	10	4	11
Chicchan	3	10	4	11	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12
Cimi	4	11	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12	6	13
Manik	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12	6	13	7	1
Lamat	6	13	7	1	8	2	9	3	10	4	11	5	12	6	13	7	1	8	......
Muluc	7	1	8	2	9	3	10	4	11	5	12	6	13	7	1	8	2	9	......
Oc	8	2	9	3	10	4	11	5	12	6	13	7	1	8	2	9	3	10	......
Chuen	9	3	10	4	11	5	12	6	13	7	1	8	2	9	3	10	4	11	......
Eb	10	4	11	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12	......
Ben	11	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12	6	13	......
Ix	12	6	13	7	1	8	2	9	3	10	4	11	5	12	6	13	7	1	......
Men	13	7	1	8	2	9	3	10	4	11	5	12	6	13	7	1	8	2	......
Cib	1	8	2	9	3	10	4	11	5	12	6	13	7	1	8	2	9	3	......
Caban	2	9	3	10	4	11	5	12	6	13	7	1	8	2	9	3	10	4	......
Ezanab	3	10	4	11	5	12	6	13	7	1	8	2	9	3	10	4	11	5	......
Cauac	4	11	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12	6	......
Ahau	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12	6	13	7	......
Imix	6	13	7	1	8	2	9	3	10	4	11	5	12	6	13	7	1	8	......
Ik	7	1	8	2	9	3	10	4	11	5	12	6	13	7	1	8	2	9	......

In giving a date, therefore, instead of giving the day name alone, the day and number both are necessary, thus: 4 Ahau, 3 Kan, 11 Ik, etc. But to complete the date so that it can be located in the 52-year cycle of the Mayas, the "calendar round," as Mr Goodman calls it, or in its proper relative position, it is necessary to have the month and day of the month, thus: 4 Ahau 18 Ceh; that is to say, 4 Ahau, the eighteenth day of the (twelfth) month Ceh. The numbering of the months never changes; that is, Ceh is always the twelfth, Pop always the first, Uo the second, and so on.

As may be seen from what has been stated, the years must begin (under the system here followed) with the days Akbal, Lamat, Ben, and Ezanab, following each other in regular order, and before the possible changes have been completed each must receive the entire 13 numerals; hence it is apparent that the period necessary to cover these changes is 52 years (4×13). If the year begin with 1 Akbal (hence called the year 1 Akbal), it will end (counting 365 days) with 1 Manik. As the next day is 2 Lamat, this will be the first day of the next year (2 Lamat). This year will end with 2 Eb and the next will begin with 3 Ben. This will end with 3 Caban and the next begin with 4 Ezanab.

This will end with 4 Ik and the next will begin with 5 Akbal, and so on until the number 13 is reached, when the count begins again with 1. The order in which the years follow one another through a complete cycle of years, or calendar round, is shown in the annexed table (3).

Table 3

Akbal	Lamat	Ben	Ezanab
1	2	3	4
5	6	7	8
9	10	11	12
13	1	2	3
4	5	6	7
8	9	10	11
12	13	1	2
3	4	5	6
7	8	9	10
11	12	13	1
2	3	4	5
6	7	8	9
10	11	12	13

This is to be followed in the order of the numbers, 1, 2, 3, 4, 5, etc. As all the possible changes are completed in a cycle of years, or calendar round (we use the term "cycle of years" to distinguish it from the period to which Goodman has unfortunately applied the name "cycle," which is not the same as the 52-year period, which he calls "calendar round"), it always begins or is supposed to begin with 1 Akbal, 1 Lamat, 1 Ben, or 1 Ezanab, according to the order or system adopted, and ends with the year 13. According to the system adopted here it always begins with 1 Akbal.

It is stated above that these tables apply to the "system adopted here." For the benefit of those not thoroughly familiar with this subject an explanation is necessary. As the Maya calendar is an orderly rotation of days, months, and years subject to the rules above stated, resulting from the numbering by 13, the 20 days to the month, 18 months to the year, and the 5 added days, any 4 days of the 20 days, selected at intervals of 5 in the series, could be adopted as dominical days. For example, it appears from the Troano codex that the people where it was made (supposed to have been those of the peninsula of Yucatan) selected Kan, Muluc, Ix, and Cauac as the dominical days, while the Tzental, with whose system the Dresden codex corresponds, selected (if the count of the days of the month began with 1) Akbal,

Lamat, Ben, and Ezanab. Mr Goodman, however, contends that the dominical days used in the inscriptions were Ik, Manik, Eb, and Caban, but instead of commencing the numbering of the days of the month with 1 and continuing with 2, 3, etc., to 20, he begins the count with 20, following it with 1, 2, 3, etc., to 19. In other words, instead of calling the first day of the month 1, he calls it 20 (these, it must be remembered, are not the day numbers, which never exceed 13, but the numbers of the days of the month). This system is in fact, as will be seen by reference to table 4 (page 745), the same—with one difference, which will be explained hereafter—as using Akbal, Lamat, Ben, and Ezanab as the dominical days; for, as will be seen by this table, Akbal, in Ik years, though by position the second day of the month, is numbered the first precisely as it is in Akbal years in our table 1.

Another point necessary to settle absolutely the system is to know which of the dominical days was placed first in commencing the fifty-two year period—in other words, what was the initial day. In table 3 it has been assumed first, that the years of this period began with 1, which has also been assumed by Mr Goodman, and second, that this first year was an Akbal year; but Mr Goodman holds that according to his system it was an Ik year, which, as has been explained, accords with our Akbal year. He expresses also an opinion that Caban was possibly the initial day.

Although this question does not affect the lower time periods, it is apparent that it does affect the numbering of the years of the fifty-two year period. This subject will, however, be referred to again.

Turning now to our table 1, we will try to make as clear as possible the method of using it so as to avoid the introduction of a multiplicity of tables. The year 1 Akbal written out in full would be as shown in table 2. It will be seen that the five figure columns after the thirteenth—to wit, the fourteenth, fifteenth, sixteenth, seventeenth, and eighteenth, numbering from left to right—are precisely the same as the first, second, third, fourth, and fifth, and that the five added or intercalary days are the same as the first five of the sixth column. As the series continued endlessly in this order, I have eliminated in my table 1 the last five columns and five added days, using the first, second, third, fourth, and fifth, and the first five days of the sixth instead.

In counting forward (by which is meant to the right), if the number of months to be counted is not completed on reaching the last or right-hand column, we go back to the first. If, as is frequently the case, our count is to be backward over past or preceding months, it must then be toward the left, and after reaching the first or left-hand column we go to the right-hand column. In other words, it is a continuous round in whichever direction we are moving, to the right being forward in time and to the left backward.

Suppose we wish to know in what year the date 6 Ahau 3 Zotz—that is, 6 Ahau, the 3d day of the fourth month (Zotz)—falls. Looking to the year columns (table 1), we see that Ahau can be the 3d day of the month only in Ezanab years. Looking along the line opposite running through the figure (or month) columns, we find 6 in the seventh column. As this is in the fourth month, to find the first we must count back (to the left) three columns, which brings us to the column headed by 9 (that is, the column whose top figure is 9); hence our year is 9 Ezanab. Now let us trace this year through by the table and find the first day of the next year. Beginning with the column headed 9, we count to the right nine columns, which brings us to the last; then we go back to the first (left-hand) and count eight. This reckoning brings us to the column headed 11. Counting 5 days down the next column (headed 5), we find that the next—the 6th day of the month—is 10 Akbal, which, as will be seen by our table of years (table 3), is correct. To follow out this year, we must begin with the month column headed 10, as this is the first month (Pop) of the year 10 Akbal.

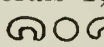
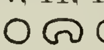
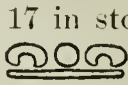
As any one day can fall on only four different days of the month, as Ahau on the 18th in Akbal years, on the 13th in Lamat years, on the 8th in Ben years, and on the 3d in Ezanab years, a mere inspection of the table will at once detect a date erroneous in this respect. For example, there can be no day Manik on the 3d, 9th, or 16th of the month, etc.

Suppose we wish to find on what date the 600th day counting forward from 7 Cib 4 Mac will fall. Looking at the table (1), we see that Cib can be the 4th day of the month only in Ben years. Running along the line opposite (horizontal line) through the figure columns, we find 7 in the column headed 4. As Mac is the thirteenth month of the year, we must count back thirteen months or columns to reach the first month of the year. Counting back the seven columns to the first (left), we then go to the last (right) and count six columns. This brings us to that headed 11; hence the year is 11 Ben, and the next year must be 12 Ezanab. As 7 Cib 4 Mac is the 4th day of the thirteenth month, there will remain of this month 16 days, 5 whole months (100 days), and the added 5 days to complete the year, or, in other words, 121 days. Subtracting this from 600, there remain 479 days to be counted, and deducting from this 365 days, or one year, 114 days remain to be counted on the next year, which must be 13 Akbal. As 114 days equal 5 months and 14 days, we begin with the figure column of our table headed 13, and count forward 5 months (including this one), and counting down the next month (column headed 9) 14 days, we reach the figure 9, and opposite it in the Akbal column find the day Cib. The date reached is therefore 9 Cib, 14th day of the (sixth) month.

Xul, in the year 13 Akbal. Turning to our table of years (3), we see that 11 Ben is the third year in the Ben column, or the eleventh year of the cycle of years, and that 12 Ezanab and 13 Akbal follow. We are thus enabled to correctly locate these dates in the cycle of years. These statements and examples, with the illustrations which follow, will enable the reader to use the tables and to follow the present investigations.

The order in which the characters in the codices and inscriptions are to be read has been fully explained in my previous publications, and so generally accepted that it is unnecessary to explain it here, especially as it is indicated in the quotation from Maudslay's work given immediately below. This author, speaking of the order in which the inscriptions are to be read, says (Biologia Centrali-Americana, Archæology, part 2, Text, November, 1890, p. 39):

> With regard to the order in which the hieroglyphics should be read, Professor Cyrus Thomas has shown, from an examination of the Palenque tablets, that when a single column only of glyphs is met with, it should be read from the top to bottom, and that when there is an even number of columns, the glyphs are to be read in double columns from top to bottom, and from left to right. I myself came to the same conclusion from an entirely independent examination of inscriptions from Quirigua and Copan, and this order is adopted in numbering the glyphs on the following plates.

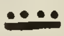
As I have also shown that this is usually, though not always, the order in which the glyphs of the codices, when in columns, are to be read, a conclusion which is now accepted by all investigators of Maya symbolic writing, we have in this fact one point of agreement between the codices and inscriptions at Palenque, Copan, Tikal, and Quirigua. The use of dots and short straight lines to indicate numerals up to 19 (each dot counting 1 and each short line 5), as in the codices, is also universal in the inscriptions, as is admitted by Mr Maudslay. He has also confirmed my suggestion (Study of the Manuscript Troano, pp. 202–203) that the little loops connected, in certain cases, with these number symbols have no signification. He says (op. cit., p. 39): "There is no reason to suppose that any different system of notation is employed on the sculptured monuments; it was not, however, usual to leave blank spaces when carving the numerals 1, 2, 6, 7, 11, 12, 16, 17 in stone, but to fill up the space thus: , 1; , 2; , 6; , 7, etc."

As the ordinary numeral symbols, the dots and lines (which are never used to signify a higher single number than 19), have been so frequently explained and are incidentally referred to in what precedes, I pass to those discovered by Dr Förstemann and Mr Goodman, as I shall have frequent occasion to use them, but will not discuss at this point the general theory presented by the latter, nor his other

supposed discoveries. He follows, as stated above, the order in reading the inscriptions first explained by me, and accepts the interpretation of the ordinary time symbols which has been universally adopted, with the single exception of that found in the Dresden codex, which has generally been explained as the symbol for "naught," or nothing. This will be again referred to hereafter.

Previous to the appearance of Mr Goodman's work, the following discoveries in regard to the numeral and time systems as given in the codices, in addition to what has been already presented herein, had been made and explained: That this symbol  was used, in counting time, to represent the number 20; that this character , somewhat variable in form, and usually colored red, was used to indicate "naught" or nothing; and that a certain prefix to month symbols, usually in the form of a double circle, thus , was used to denote 20, signifying, when thus used, the 20th day of the month. It was further ascertained, as may be seen by reference to papers by Dr Förstemann and myself explanatory of time series in the Dresden codex, that the orders of units in counting long periods, the day being the primary or lowest unit, was as follows: 20, 18, 20, 20, 20; that is to say, 20 units of the first order make one of the second order, 18 units of the second order make one of the third order, 20 units of the third order make one of the fourth order, 20 units of the fourth order make one of the fifth order, and 20 units of the fifth order make one of the sixth order. These different units, save those of the first order, were not expressed by specific symbols, but by position, that is, by being placed one above another, as is here shown, the lowest indicating the first, the next above the second order, and so on.

9 units of the fifth order, , 9 cycles.

9 units of the fourth order, , 9 katuns.

9 units of the third order, , 9 ahaus.

16 units of the second order, , 16 chuens.

0 units of the first order, , 0 days.

For the purpose of explanation and comparison I have placed to the left of the symbols their equivalents in Arabic numerals, and in the column to the right the equivalents according to Mr Goodman's nomenclature, which will be explained a little further on.

This example is not an arbitrary one, but is taken from plate XXIV of the Dresden Codex, and has been selected because it was explained by Dr Förstemann, so far as the numbers and count are concerned, in 1887 (Zur Entzifferung der Mayahandschriften, 4, 1887). According

to Dr Förstemann the number of days indicated by these numeral symbols as thus placed is 1,364,360, the length of the periods being as follows:

	Days.
1 cycle	144,000
1 katun	7,200
1 ahau	360
1 chuen	20

Now let us test it by Mr Goodman's system, using his own tables (last page of his paper) for this purpose:

	Days.
9 cycles	1,296,000
9 katuns	64,800
9 ahaus	3,240
16 chuens	320
Days	0
	1,364,360

It is evident from this result that this, so far as the system is concerned, is, up to the fifth order of units, precisely that discovered and applied by Dr Förstemann, except as to the "naught" symbol. Even the very order and method of expressing a series which Mr Goodman uses, so far as applicable to the codices, was, as will be seen a little further on, used by Dr Förstemann. In order that I may not do injustice to Dr Förstemann when I speak of the discoveries by Mr Goodman, it is proper to add that not only had he discovered and applied to the time series of the Dresden codex the orders of units accepted and used by Mr Goodman, but had determined as early as 1891 the value of the symbols designated "ahau" and "katun," as appears from his article Zur Maya-Chronologie in the Zeitschrift für Ethnologie for that year. Mr Goodman's paper was not published until 1897, though it is apparent from his preface that it was completed in 1895. If Dr Förstemann had not seen Mr Goodman's paper when his article entitled Die Kreuzinschrift von Palenque, was published in the Globus in 1897—which makes no mention of the former, though referring to works on the subject—it is evident he had discovered independently the value of the symbols which Goodman designates chuen and cycle. To the 360-day period he applied the name "old year" under the supposition that in an earlier stage of their culture the Mayas counted only 360 days to the year; and to the 7,200-day period the name "old ahau." However, it appears from his Entzifferung der Mayahandschrift, number IV, 1894, that as early as June of this year he had calculated correctly the value of some six or eight numeral series on the stelae and altars of Copan from Maudslay's work. This implies necessarily a knowledge of the value of the so-called time periods, and indicates that he had made

this discovery independently, unless he had received some information on the subject from Maudslay of which I have no knowledge. It is apparent from a statement by the latter author in part 2 of his work, published in 1890, that the values of these symbols, save that of the chuen, were yet unknown to him. However, as Dr Förstemann seems to have fallen short of the discovery of their uses and the application of them, the chief credit of the discovery must be awarded to Mr Goodman.

This discovery, which must cancel a number of previous speculations and affect to a large extent all attempts at interpretation of the inscriptions and codices, consists, first, in finding out the fact that in the inscriptions the orders of units above the first, to wit, his so-called chuens, ahaus, katuns, and cycles, were not indicated by position as in the codices, but each had its distinct character or glyph; second, in determining these characters and their values; and, third, in showing from the inscriptions the order in which they are generally arranged and the manner in which the truth of this discovery may be demonstrated. He has also discovered that a certain character, which he terms a "calendar round symbo'," was used to indicate the period of 52 years, which has heretofore usually been designated a "cycle" or "cycle of years," and also that certain face characters are used as numeral symbols. As we shall have occasion to use these in our investigation of the inscriptions, the usual forms of the principal ones (using Mr Goodman's names) will be shown here and his other claimed discoveries will be considered hereafter.

The Chuen

This character usually has a numeral symbol on top and at the left side, the former indicating the number of chuens and the latter the added or overplus days.

a b c

Fig. 8—The chuen symbol.

The Ahau

The numeral indicating the number of ahaus is usually placed at the left.

a b c d e

Fig. 9—The ahau symbol.

The Katun

The numeral indicating the number of katuns is usually placed at the left side, though occasionally at the top.

a b c d e

Fig. 10—The katun symbol.

The Cycle

The numeral in this case is also usually at the left side.

a b c d

Fig. 11—The cycle symbol.

The Calendar Round

The numeral is usually at the left side.

a b c

Fig. 12—The calendar round symbol.

The forms of the day symbols usually found in the inscriptions are as shown in figure 13.

The month symbols usual in the inscriptions, including what Mr Goodman claims is the symbol for the five added days or Uayeb, are shown in figure 14.

The typical and usual form of the chuen is shown in the first two glyphs of figure 8 (*a*, *b*). If the number at the top were 3 (three

FIG. 13—The day symbols.

dots or balls), it would signify three chuens or 60 days (3×20); the number at the side if 12 would denote 12 days. It would then read 12 days, 3 chuens, or 3 chuens, 12 days, which together would equal 72 days. This is the only counter or time period symbol which has two numbers attached. It may as well be stated here, to prevent confusion or misunderstanding in regard to our use of terms, that for convenience in our comparisons Mr Goodman's names of these several symbols and the time periods he supposes them to represent will be used, although

I am firmly convinced, for reasons which will be shown hereafter, that they are nothing more than orders of units or multipliers. Therefore, when they are spoken of as "time periods," or by the names given, this must be borne in mind.

The typical and usual form of the ahau is shown in the first three glyphs of figure 9 (*a*, *b*, *c*). This symbol denotes 360 days, which must be multiplied by the numeral—usually at the side—to obtain the full number of days indicated. The name ahau as here used must not be confounded with the day-name Ahau.[1] The use of the same name for two different purposes is unfortunate and confusing.

The usual form of the katun is shown in the first two glyphs of fig-

FIG. 14—The month symbols.

ure 10 (*a*, *b*). The attached numeral, if 1 or 2, is frequently at the top, though usually at the side. As this symbol represents 7,200 days, the number of days indicated is 7,200 multiplied by the attached numeral.

The usual cycle symbol is shown by the first glyph of figure 11 (*a*). As the cycle is 144,000 days, 144,000 must be multiplied by the attached numeral to obtain the total number of days.

The great cycle will be referred to hereafter, and the other forms of the chuen, ahau, katun, and cycle will be discussed as the series by which their values are determined are examined.

[1] The day name is always written with a capital, the ahau denoting a period with a small letter.

TIME SERIES IN THE CODICES AND INSCRIPTIONS

The Dresden Codex

As the Dresden codex is now so generally known, it will be made the point of departure and the first examples showing the method of counting time will be taken from it. In this examination further comparison will be made between the system used by Mr Goodman in counting time series and that first made known by Dr Förstemann and used by him and myself in the papers relating to this subject which have been published. As I have somewhat fully illustrated and explained in my Aids to the Study of the Maya Codices (in Sixth Ann. Rep. Bur. Ethnology), a considerable number of the time series of the Dresden codex, in which the figures do not rise above the fourth order of units, the examples referred to here will be those involving high numbers, in order to strengthen the proof of Dr Förstemann's theory and to establish clearly the respective values of the units in the higher orders. These will also necessarily indicate the calendar system in vogue, to which it is desirable to call special attention.

The names of the several orders of units is a matter which failed to receive attention until the subject was taken up by Mr Goodman; those that he has applied are unfortunate and can result only in confusion so long as they remain in vogue. Dr Brinton remarks that "No doubt each of these periods of time had its appropriate name in the technical language of the Maya astronomers, and also its corresponding character in their writing. None of them has been recorded by the Spanish writers, but from the analogy of the Nahuatl script and language, and from cer.ainin dications in the Maay writings, we may surmise that some of these technical terms were from one of the radicals meaning 'to tie, or fasten together,' and that the corresponding signs would either directly (that is, pictorially) or ikonomatically (that is, by similarity of sound) express this idea" (Primer, pp. 30, 31). He suggests *bak* for the 360-day period, and *pic* for the 7,200-day period, and *kal* for the 20-day period. The name chuen, which Mr Goodman has applied to the month equivalent, the 20-day period, was adopted by him because of the resemblance of the glyph to the symbol of the day Chuen. This duplicates the name in the time series. The same objection applies to the names ahau, katun, and cycle; each of these is now applied in three different senses in the calendar system, ahau being used as a day name; as a name of the 24 or 20 year period, and now for the unit of the third order, or 360-day period; katun for the 24 or 20 year period, with ahau prefixed for the 312-year period, and for the unit of the fourth order, or 7,200-day period; and cycle for the 52-year period, also sometimes for the 260-day period, and now for the unit of the

fifth order or the 144,000-day period. Förstemann, as has been already stated, applies the name "old year" to the 360-day period, apparently under the idea that it at some previous time constituted the full year; "old ahau" to the 7,200-day period (a fourth application of this term); and "old katun" to a period of 18,720 days or 52 "old years" ($52 \times 360 = 72 \times 260$). To express 9 cycles, 12 katuns, 18 ahaus, 5 chuens, 16 days, Mr Goodman uses this abbreviation: 9–12–18–5 × 16, the × indicating that the two numbers between which it stands are usually attached to one symbol. Dr Förstemann, as an abbreviation to express the same orders of units, uses the same method, omitting only the ×, thus: 10, 19, 6, 0, 8 (Zur Entzifferung der Mayahandschriften, 1887, p. 6).

It will perhaps be as well to insert here what I have to say in reference to Mr Goodman's expressions in regard to, and use of, the term ahau as applied to a time period. The names applied to time periods as a means by which to refer to them are comparatively unimportant, unless such application involves other questions. We quote first the following passage from his work (p. 21):

I now come to what has been a stumbling-block to every one who has hitherto attempted to deal with the Maya records. It has been known that the Mayas reckoned time by ahaus, katuns, cycles, and great cycles, but what was the precise length of any of these periods has been a debatable question. Some have contended, with the best of proof apparently, that the katun is a period of twenty years, while others have maintained, with proof equally as good, that it is a period of twenty-four years. The truth is, it is neither.

The contention arose from a misapprehension, or total ignorance rather, of the Maya chronological scheme. It was taken for granted that a year of 365 days must necessarily enter into the reckoning; whereas the moment the Mayas departed from specific dates and embarked upon an extended time reckoning, they left their annual calendar behind and made use of a separate chronological one.

The use of the term ahau-katun is avoided everywhere in these pages. Such a period never existed, except as a delusion of Don Pio Perez and his misguided followers. The error originated from a misconception of the Yucatec method of distinguishing the katuns. The ahau was numbered according to its position in the katun, as the eighth, tenth, or the sixth from the close; but the katun was designated by the particular number of the day Ahau with which it ended. Thus, for instance, it might sometimes be spoken of as the katun 10 Ahau; and at other times by a mere reversal of the phrase, as the 10 Ahau katun. More frequently, however, the term katun was not used at all, its existence and number being implied by simple mention of the ahau date. But there was no ahau-katun.

On page 23, in speaking of the ahau, he adds:

This period is the real basis of the Maya chronological system. Everything proceeds by ahaus, till in succession the katuns, cycles, great cycles, and grand era are formed from them.

The ahau is a period of 360 days—the sum of the days in the eighteen regular months—and derives its name undoubtedly from the fact that it always begins with the day Ahau. It is the period, not between two Ahaus with the same numeral, but between the second two with a differentiation of four in their day numbering. Moving forward with this progression of four it results that the ahaus follow each other

in the order of 9, 5. 1, 10, 6, 2, 11, 7, 3, 12, 8, 4, 13, 9, 5, 1, and so on—an order of succession that Perez quotes from an unnamed manuscript, but whose significance he failed to grasp.

Twenty ahaus constitute a katun. They are numerated: 20, 1, 2, 3, etc, up to 19.

Finally, in speaking of the katun (p. 24), he says:

It is over this period that the battle royal has been fought. The question of twenty or twenty-four years has raged undeterminedly for more than half a century. As the facts themselves will show the folly of the whole contention, I pass it by without awarding to any individual combatant the discredit of his partisanship.

Twenty years of 365 days make 7,300 days. The katun does not reach that far, falling a hundred days short, as a multiplication of its constituent parts will show: $360 \times 20 = 7{,}200$.

In consequence of the day Ahau beginning the ahaus, it must also begin the katuns; and the ahaus succeeding each other by differences of four, as 9, 5, 1, 10, 6, 2, 11, 7, 3, 12, 8, 4, 13, 9, 5, 1, 10, 6, 2, 11, 7, etc, it results that the order of the katuns, composed as they are of twenty ahaus, must be one in which each succeeding katun begins with a day number two less than its forerunner—thus: 11, 9, 7, 5, 3, 1, 12, 10, 8, 6, 4, 2, 13, 11, etc.

The katuns are numerated in the same manner as the ahaus: 20, 1, 2, 3, etc, up to 19.

Let us examine these expressions so far as they relate to the ahau and bear upon the Maya system as developed in the record.

He says the ahau is a period of 360 days, "and derives its name undoubtedly from the fact that it always begins with the day Ahau." This is undoubtedly the use he makes of it; but was it used by the Mayas in this sense? That he has derived this name as applied to the period of 360 days from the inscriptions appears nowhere in his work. He nowhere asserts or pretends to claim that the symbol denoting this period is in any sense phonetic, giving this name. The only early native authorities to which we can appeal are the Chronicles. To these, therefore, we refer, following Dr Brinton's translation.

In the Chronicle from the Book of Chilan Balam of Mani, the ahaus are numbered over and over again as containing each twenty years. In the thirteenth paragraph (p. 103) it is said "in the thirteenth ahau Ahpula died; for six years the count of the thirteenth ahau will not be ended." It is evident from this, be the count confused and even erroneous, that the author considered the ahau as composed of more than six years. The Chronicle of Chumayel also speaks of the sixth year of the thirteenth ahau, the seventh year of the eighth ahau katun (uaxac ahau u katunil), and the first year of the first ahau katun (ahau u katunile). Another Chronicle of Chumayel expressly makes ahau the equivalent of katun—"the fourth ahau was the name of the katun"—and uses ahau, katun, and ahau katun as synonyms (ahau u katunil).

It is evident from these extracts, be the originals trustworthy or not, that Mr Goodman could not have found therein evidence for his application of the term ahau. Nor can it be obtained from Landa,

who expressly mentions "primero año de la era de *buluc-ahau*," and of the natives doing homage to the various ahaus for ten years each. Mr Goodman's radical error, as we shall see, is taking numerical notation for a time system.

The first example to which attention is called is taken from plate 24 of the Dresden codex, and includes that portion of a long series running up the plate which is shown in our figure 15.

If the order in which the series ascends be that in which it is to be followed, it is evident this must be from right to left, taking the lower division first, thus: D2, C2, B2, A2 (in the lower division), then D1, C1, B1, and A1 (in the upper division). But the plan of the series may be the reverse of this, as it is possible that it runs back in time, and is to be read from left to right the differences between the columns being subtracted instead of added; the result is, however, the same. As there are no month symbols by means of which to determine the years, and our only object in referring to the series is to show the value of the symbols according to the relative positions they occupy in relation to one another, the order in which they are to be read, and the value of the counters, it is not material in which direction the series be taken. We will therefore follow the ascending order—i. e., from right to left, beginning with D2 (right-hand column in lower division). Using Goodman's names, and subtracting D2 from C2 (the ovals which are red in the original being counted as naught) thus:

A B C D

1

2

6 Ahau 11 Ahau 3 Ahau 8 Ahau

FIG. 15—Part of plate 24, Dresden codex.

	C2	D2	Diff.
Katuns....	4	3	
Ahaus	1	13	8
Chuens ...	2	0	2
Days......	0	0	0

we find the difference to be 8 ahaus, 2 chuens, 0 days. As the day at the foot of the column (D2) is 8 Ahau, without an accompanying month symbol, we may select in our table 1 any 8 Ahau and assign it to any month, as the count will hold good.

For convenience we select 8, the third number in the figure column headed 6, and find Ahau opposite in the Ezanab column. Assuming the month to be Pop, the first month of the year, the year will be 6 Ezanab. As eight ahaus contain 2,880 days, and two chuens 40 days—

together 2,920 days—we subtract therefrom 362, the remaining days of the year 6 Ezanab, thus:

	Days
8 ahaus......	2,880
2 chuens.....	40
	2,920
	362
	2,558

Dividing this remainder (2,558) by 365, we find the number of years to be seven, with an overplus of three days. Looking now to our table of years (3) and counting forward seven years from 6 Ezanab, we reach 13 Ben. As the next year is 1 Ezanab, we look in table 1 to the column headed 1 and count down this to the third day. This brings us to 3, and we find Ahau opposite in the Ezanab column. The day reached is therefore 3 Ahau, which is the day at the bottom of column C2 in our figure 8, showing the count to be correct.

This example, however, involves another question raised by Mr Goodman. It will be noticed that in column D2 of our figure the day place and the chuen place is each filled by an oval figure (red in the original) instead of the ordinary numeral symbols, and that in column C2 the day place is filled by a similar oval figure. In my calculation given above I have counted these as equivalent to ciphers (0), or nothing. Mr Goodman observes (page 64) that a number of persons have declared this to be a sign for naught, adding: "They were led into this mistake, undoubtedly, by its peculiar use and position. It is employed in the codices solely to designate initial periods, and in that position it is the equivalent of 20 in all cases except that of the chuen, where, like the other 20-signs, it denotes but 18." As the example now under consideration affords an opportunity of testing this interpretation, we will do so.

It is apparent from what has been shown that the correct result is obtained by counting these symbols as naught. If the same result be obtained by counting them as signs of full count—that is, 20—or as 18 where filling the chuen place, the test fails to disclose the correct use of them.

Counting the total days in each column and subtracting the sum of D2 from that of C2, the result is as follows:

C2		D2	
4 katuns	28,800	3 katuns	21,600
1 ahau	360	13 ahaus	4,680
2 chuens	40	18 chuens	360
Days	20	Days	20
Total days	29,220	Total days	26,660
	26,660		
Difference............	2,560		

Assuming, as before, 8 Ahau, at the bottom of column D2, to be the 3d day of the month Pop in the year 6 Ezanab, we subtract from 2,560 days 362, the remaining days of the year 6 Ezanab. This leaves 2,198, which, divided by 365, gives 6 years and an overplus of 8 days. Counting from the year 6 Ezanab (table 3) 6 years, we reach the year 12 Lamat. The next year will be 13 Ben. Turning to table 1 and counting 8 days down the column headed 13 (as the eighth day from the beginning of the year must fall in Pop, the first month of the year), we reach the numeral 7, and find opposite in the Ben column the day Ahau; hence the day reached is 7 Ahau, and not 3 Ahau, as it should be. The addition of days to the total difference by even twenties will, of course, bring the count back to Ahau, hence the test lies in the number attached to it. It appears, therefore, so far as this example is concerned, that these oval symbols stand for naught, and not for 20 and 18, as inferred by Mr Goodman. It will be observed that the same symbol appears in the other columns of figure 8 copied from plate XXIV, Dresden codex. Positive proof that this oval is used for naught is found on plate 50 of the Dresden codex, which may be seen in plate I of my Maya Year. The oval in the bottom line filling the month or chuen place can reach the required day only when counted as naught, as may be verified by reference to the series of days given in the same work.

In the quotation above from Mr Goodman's work in relation to the red oval symbol which I have counted as naught, he says: "It is employed in the codices solely to designate initial periods." Precisely what he means by this remark I fail to comprehend. When the symbols are found in the same time series in the month place and in the immediately following day place, and then at odd years and months apart in a continuous series, how they can be used to designate initial periods is difficult to understand, unless very short periods are alluded to. That the symbol for no day, or naught, in the day place will indicate the beginning of a month in the count which is to follow is undoubtedly true, and when it is in the month place a new year will follow, and so on. This is also true when 20 days, 18 months, 20 ahaus, etc, are counted. If this be what Mr Goodman means, he is correct; but it is hardly the idea conveyed by his language, which apparently refers to "initial periods," as though of a katun, cycle, or calendar round.

The next column to the left (B2) has 4 katuns, 9 ahaus, 4 chuens, 0 days, and at the bottom 11 ahau. Subtracting from this column the column C2, already given, we have the following result:

	B2	C2	Diff.
Katuns......	4	4	
Ahaus.......	9	1	8
Chuens......	4	2	2
Days........	0	0	0

The remainder, 8 ahaus and 2 chuens, equals 2,920 days, and is precisely the same as the difference between the preceding columns. As the date reached by column C2 was 3 Ahau, the 3d day of Pop, the first month in the year 1 Ezanab, we subtract as before 362, the remaining days of the year 1 Ezanab, from 2,920. This leaves 2,558 days, or 7 years and 3 days. Counting from the year 1 Ezanab (table 3), 7 years, we reach 8 Ben, the next year being 9 Ezanab. Counting down the figure column headed 9 (table 1), 3 days, we reach the numeral 11 and find Ahau opposite in the Ezanab column. The day reached is therefore 11 Ahau, 3 Pop, the first month of the year 9 Ezanab, and corresponds with the day at the foot of column B2 in the plate.

As the difference between column A2 and B2 is precisely the same as that between the other columns (8 ahaus 2 chuens), we have only to count 7 years and 3 days from the close of the year 9 Ezanab. This brings us to the 3d day of the month Pop in the year 4 Ezanab, which we find, by referring to Table I, to be 6 Ahau, corresponding with the day at the bottom of column A2. It must be remembered, however, that the years mentioned have been those following the arbitrary selection for convenience in calculating, as nothing has been discovered in the series to determine these. This could be ascertained if the top series were uninjured, so as to carry on the count to the lower left-hand series, which have definite dates.

Passing now to the upper division of our figure, we notice that the day at the bottom of each column is 1 Ahau and that the day place in each is filled by the oval symbol, denoting, according to our interpretation, naught. As the series ascends toward the left, the columns will be taken in the same order as those of the lower division. We therefore subtract D1 from C1:

	C1	D1	Diff.
Katuns.......	4	1	3
Ahaus........	12	5	7
Chuens.......	8	5	3
Days.........	0	0	0

The difference is 3 katuns (=21,600 days), 7 ahaus (=2,520 days), 3 chuens (=60 days), and no odd days. The total is 24,180 days. As the number is large, exceeding a 52-year period or calendar round, we can subtract the greatest possible number of these periods (in this case only one) without in any way affecting the result so far as reaching the proper date is concerned, but the number of years thus embraced are to be counted in making up the true interval between the dates.

As 1 Ahau may be the 3d day of the first month (Pop) of the year 12 Ezanab, we select this as our starting point.

One calendar round equals 18,980 days, which subtracted from 24,180 leave 5,200 days. Taking from this number 362—the remaining

days of the year 12 Ezanab—and dividing the remainder (4,838) by 365, we obtain 13 years and an overplus of 93 days, or 4 months and 13 days. Counting on our table 3, 13 years from 12 Ezanab, we reach 12 Akbal. As the next year is 13 Lamat, we count forward on table 1, 4 months and 13 days. This brings us to 1, the 13th day in the column headed 2, and opposite, in the Lamat column, we find the day Ahau, agreeing with the date at the foot of the column C1 of our figure. The date here is therefore 1 Ahau, the 13th day of Tzec, the 5th month of the year 13 Lamat, according to the assumed initial date.

As the differences between the columns of the upper division of our figure are not the same, a calculation must be made in each case to make the proof positive.

Subtracting column C1 from B1, we find the remainder to be 4 katuns, 18 ahaus, 17 chuens, 0 days, together equal to 35,620 days. Subtracting one calendar round—18,980—there remain 16,640 days. As our last date was 1 Ahau, the 13th day of Tzec, the 5th month of the year 13 Lamat, our count now must be from this date. Subtracting 272—the remaining days of this year—from 16,640 and dividing the remainder by 365, we obtain 44 years and an overplus of 308 days. Referring to table 3 and counting 44 years from 13 Lamat, we reach 5 Lamat. As the next year is 6 Ben, we count 308 days, or 15 months and 8 days, in this year. This brings us to the 8th day of the 16th month (the column headed 7), which we find is 1, and opposite, in the Ben column, the day Ahau, which agrees with the plate. The date therefore is 1 Ahau, the 8th day of Pax, the 16th month of the year 6 Ben.

Subtracting column B1 from A1, we find the difference to be 16 katuns, 2 ahaus, 15 chuens, 0 days, equal to 116,220 days. Subtracting 6 calendar rounds, or 113,880 days, we get the remainder 2,340. As our last date was 1 Ahau, 8th day of Pax, 16th month of the year 6 Ben, we subtract from 2,340 days 57, the remaining days of the year 6 Ben. This leaves 2,283 days, which divided by 365 gives 6 years and an overplus of 93 days. Counting on table 3, 6 years from 6 Ben, we reach 12 Akbal, the next year being 13 Lamat. Counting on table 1, 93 days, or 4 months and 13 days, beginning with the column headed 13, and 13 days down the column headed 2, we reach 1, and find opposite, in the Lamat column, the day Ahau, which agrees with the plate. The dates obtained are, it must be remembered, based on the assumed starting point 1 Ahau, 13 Tzec, year 13 Lamat; this, however, does not affect the correctness of the result.

As has been stated, to obtain the true interval where calendar rounds (or cycles of 52 years) have been subtracted, these must be added. The true interval, therefore, between column B1 and A1 of our figure 8 is $6 \times 52 + 6 = 318$ years and $57 + 93$ days, or 318 years 7 months and 10 days.

These examples are sufficient to prove beyond any reasonable doubt the correctness of Dr Förstemann's method of counting the time symbols of the Dresden codex, and that his orders of units, or time periods, used in counting, up to and including the cycle, were precisely the same as those subsequently presented and used by Mr Goodman in his work. It also shows that my calendar tables 1 and 3 have the days, months, and years arranged consistently with the Dresden codex, and that they can be successfully used in examining and tracing the long or high time counts, at least so far as tried. We might dismiss the Dresden codex with these examples but for the fact that there are some series reaching still higher figures to which Dr Förstemann has called attention. Therefore, before passing to the inscriptions, a few of these will be noticed and the attempt to connect the dates which seem to be related will be made—something which has not been done by Dr Förstemann, and in which the proof of his theory lies.

We take as the first example the two series, black and red, running up the folds of the serpent figure, plate 69, following Dr Förstemann's method and assuming that the two series are connected. They are as follows, Goodman's names being attached:

	Red	Black	Difference		*Days*
Great cycles	4	4	0	equals	0
Cycles	6	5	0	equals	0
Katuns	1	19	1	equals	7,200
Ahaus	0	13	7	equal	2,520
Chuens	13	12	1	equals	20
Days	10	8	2	equal	2
Days below	9 Ix	4 Eb	Difference in days		9,742

The total days of the two columns as given by Dr Förstemann are as follows:

Red	12,391,470
Black	12,381,728
Difference	9,742

Same as above.

As the month symbols are obliterated, we will assume 4 Eb under the black column to be the 5th day of the month Pop in the year 13 Lamat. Subtracting 360, the remaining days of the year 13 Lamat, from 9742, and dividing the remainder by 365, we obtain 25 years and 257 days, or 25 years 12 months and 17 days. Examining table 3, and counting forward from 13 Lamat 25 years, we reach 12 Ben. As the next year is 13 Ezanab, counting on table 1, 12 months and 17

days on this year, we reach 9 Ix, the 17th day of Mac, the 13th month of the year 13 Ezanab, which corresponds with the day under the red column.

As the columns and totals are precisely as given by Dr Förstemann (Zur Entzifferung der Mayahandschriften, 1891, p. 17), we have proof here of the correctness of his system and of the value assigned the several orders of units or time periods which, in one of the series, involves very high numbers, and also proof that they are precisely the same as the time periods used by Mr Goodman in his work, which appeared six years later, with the one exception noted below.

In calculating these series, Dr Förstemann has assumed that 20 units of the fifth order make one of the sixth order; or, to use Mr Goodman's nomenclature, that 20 cycles make one great cycle. Although the latter author counts but 13 cycles to the great cycle, according to the chronological system he believes was used by the authors of the inscriptions, he admits that in the Dresden codex the count was 20, which is evident from plate 31, where the place of the fifth order of units (cycles) has the number 19.

As the opportunity is afforded here of testing on a higher unit Mr Goodman's theory that the red oval indicates full count (20 where this is the proper number, or 18 where that is the number), I shall use it. As will be seen by reference to page 723 where the series are given, the ahaus of the red series are counted as 0 (naught), when according to Mr Goodman's theory they should be 20. Let us try the calculation with this number. Subtracting the black from the red as before, the result is as follows:

	Great Cycles	Cycles	Katuns	Ahaus	Chuens	Days
	4	6	1	20	13	10
	4	5	19	13	12	8
Difference......			2	7	1	2

This difference reduced to days gives 16,942 instead of 9,742, as by the former method. Assuming 4 Eb under the black column, as before, to be the 5th day of the month Pop in the year 13 Lamat, we subtract 360, the remaining days of the year 13 Lamat, from 16,942, and, dividing the remainder by 365, obtain 45 years and an overplus of 157 days—7 months 17 days. By table 3 we find that counting 45 years from 13 Lamat brings us to 6 Ben, the next year being 7 Ezanab. By table 1 we ascertain that the 17th day of the 8th month of this year is 7 Ix. This is wrong, as it should be 9 Ix, the day number being the test in this case, as the addition of even months will necessarily bring us back to the same day. This shows Mr Goodman's theory on this point to be incorrect so far as the Dresden codex is concerned, where this particular symbol is chiefly, if not exclusively, used.

Our next example is from plate 62, is, like the preceding, in the

folds of a serpent (the one to the right), and consists of two series, one black, the other red. These have also been calculated by Dr Förstemann and arranged according to the order of units as given here. Mr Goodman's names are given opposite and differences to the right.

	Black	Red	Difference	
				Days
Great cycles	4	4	0 equals	0
Cycles	6	6	0 equals	0
Katuns	9	1	8 equal	57,600
Ahaus	15	9	5 equal	1,800
Chuens	12	15	15 equal	300
Days	19	0	19 equal	19
Days below	3 Kan	13 Akbal	Total	59,719
Months	16 Uo	1 Kankin		

Dr Förstemann's totals are as follows:

Black	12,454,459
Red	12,394,740
Difference	59,719

showing his result to be precisely the same as that obtained by using the Goodman periods, or rather showing the Goodman periods to be precisely the same as those used by Dr Förstemann with one exception. Before proceeding, it is necessary to notice that the day Kan is never the 16th day of the month, but may be the 17th, therefore the date 3 Kan 16 Uo, under the black column, must be changed to 3 Kan 17 Uo. In this example the counting must be backward in the order of time if we proceed from the lower to the higher series.

Subtracting 3 calendar rounds (56,940 days) from 59,719, the difference given above, the remainder is 2,779 days.

As 13 Akbal 1 Kankin, is the first day of the fourteenth month of the year 13 Akbal, we count backward from this date. In counting backward, if we start with—that is, include—the day named, the day sought will be the next beyond the last day counted. As 1 Kankin is the two hundred and sixty-first day of the year 13 Akbal, we subtract this number from 2,779, and, dividing the remainder by 365, obtain 6 years and a surplus of 328 days, taking from this the 5 added or intercalary days there remain 323, or 16 months and 3 days to be counted back on the year reached. Counting back on our table 3 6 years from the year 13 Akbal, we reach 7 Ben, the next year being 6 Lamat. Subtracting 16 months and 3 days from 18 months, the remainder is 1 month and 17 days; hence the day reached will be the seventeenth day of the month Uo in the year 6 Lamat. This, by reference to table 1,

is found to be 3 Kan, the same day as that below the column of black numerals, when the correction from 16 to 17 has been made.

As this paper is designed in part as a help to those commencing the study of the codices and inscriptions, we will, like the surveyor who sights back and forth to insure accuracy, trace this series forward, a process which should, as a matter of course, result correctly if our count was right in tracing it backward.

Starting with 3 Kan, the 17th day of the second month Uo, in the year 6 Lamat, we count forward to the end of this year 328 days, which, subtracted from 2,779, the remainder given above, leave 2,451 days to be counted. Dividing by 365, we obtain 6 years and an overplus of 261 days, or 13 months and 1 day. Counting forward on table 3 6 years from the year 6 Lamat, we reach 12 Ezanab, the next year being 13 Akbal. Counting on table 1 the term of 13 months and 1 day, beginning with the column headed 13, we reach the same 13, and opposite in the Akbal column find the day Akbal. The date is therefore 13 Akbal, the 1st day of the fourteenth month—Kankin—of the year 13 Akbal, which proves the process to be correct.

Our next example consists of the two series, same plate of the Dresden codex, placed in the folds of the left serpent, as follows (prefixing Goodman's names as before):

	Red	Black	Difference		
					Days
Great cycles	4	4	0	equals	0
Cycles	6	6	0	equals	0
Katuns	11	7	3	equal	21,600
Ahaus	10	12	18	equal	6,480
Chuens	7	4	2	equal	40
Days	2	10	12	equal	12
Days below	3 Ix	3 Cimi		Total ...	28,132
Months	7 Pax	14 Kayab			

Subtracting from 28,132 one calendar round—18,980 days—leaves 9,152 days. As it is somewhat easier to count forward than backward, though the other order appears really to be the one adopted here, we will begin with the date under the red column—3 Ix the 7th day of the sixteenth month (Pax) of the year 9 Lamat. As there remain 58 days in this year after the date given, we subtract this number from 9,152 and divide the remainder by 365, and obtain 24 years and an overplus of 334 days, or 16 months and 14 days. Referring to table 3, we find that by counting forward 24 years from 9 Lamat, we reach 7 Lamat, the next year being 8 Ben. By table 1 we find

that the 14th day of the seventeenth month (Kayab) of this year is 3 Cimi, which proves the calculation to be correct.

To those familiar with the Dresden codex it will be apparent that the month symbol used under the red column looks as much if not more like that for Tzec than that for Pax, yet, as it has elements of both and as the calculation works out only with Pax, it has been assumed that this is the month intended. That the month Tzec can not in any way be made consistent with the numbers of the series is easily made manifest thus: 3 Ix, the 7th day of the fifth month Tzec, will fall only in the year 8 Lamat, and 3 Cimi, the 14th day of the seventeenth month Kayab, only in the year 8 Ben. Looking on table 3, we see that in counting forward from 8 Lamat to 8 Ben we pass over an interval of only 12 years, and in counting backward over an interval of 38 years. As the interval shown by the numerals is (after one calendar round, which does not affect the count, has been subtracted) 9,152 days, it is apparent that 7 Tzec can not be the date intended. Förstemann's totals of these series are as follow:

Red	12,466,942
Black	12,438,810
Difference	28,132

showing precisely the difference given above. The absolute difference between the two dates is 2 months 18 days+52 years+24 years+16 months+14 days, which, together, equal 77 years and 27 days.

The immense stretch of these periods is a point not to be overlooked. One of those referred to amounts to 12,466,942 days, or 34,156 years and 2 days, counting 20 cycles to the great cycle, according to Förstemann's method. This brings up again the question as to the number of units of the fifth order to form one of the sixth, or, using Goodman's terms, the number of cycles which make a great cycle. Although the discussion of this question would perhaps be more appropriate after we have considered the inscriptions, it may as well be introduced here.

Mr Goodman, while holding 13 as the number in the inscriptions, admits that in the Dresden codex 20 was the number used; but this admission only renders the subject more complicated, as there is no reason to believe that a different rule prevailed in the inscriptions from that in the codex. That the vigesimal system of notation was the rule among the Maya tribes is well known, the use of 18 units of the second order to make one of the third, in time counting, having apparently been adopted for convenience in bringing the month into the calculation. This fact, though not positive proof of regular vigesimal succession elsewhere in the time system, is sufficient to justify the assumption of regularity, unless satisfactory evidence of variation can be adduced.

Although the last example reaches to the great cycle, and involves

the count of cycles, it does not afford the proof necessary to decide this question, as is apparent by trial, as the difference between the two series will be the same whether we count 20 cycles to the great cycle or 13. There is, however, one series in the codex (plate 31) heretofore referred to which will decide this point. This, which is in the right half of the upper division, is as follows:

19 cycles
9 katuns
9 ahaus
3 chuens
0 days

There is also one series in the inscriptions found on Maudslay's Stela N of the Copan ruins which seems to settle the question. This is as follows:

14 great cycles
17 cycles
19 katuns
10 ahaus
0 chuens
0 days

This reckoning, however, Mr Goodman assures us "is not only wrong, but absurd as well. The cycles run only to 13, and no such reckoning backward or forward from the initial date would reach a 1 Ahau 8 Chen," the next date, the first being 1 Ahau 8 Zip. He changes it to 14 great cycles, 8 cycles, 15 katuns, 10 ahaus, 18 chuens, 20 days.

It is true that, with the interpretation given of the date characters and the chuens and days, the reckoning backward or forward would not reach 1 Ahau 8 Chen. But this interpretation is by no means certain throughout. In the first place, it is not certain, judging by Maudslay's photograph, that the chuen symbol does not have a numeral 1 at the left, as it is like one on Stela C, where, according to Maudslay's drawing, there is 1, and the count may possibly, as will hereafter appear, reach back to some more distant date, as is found to be the case in several inscriptions. However, Mr Goodman interprets it differently.

In the second place, the month symbol of this last date can not with absolute certainty be interpreted Chen; for as shown by the photograph it may be Yax, Zac, or Ceh, apparently Zac. The numerals attached to the higher periods are clear and distinct, but the month symbol of the first date, which is upside down, is as much like Uo as like Zip, if we judge by Mr Goodman's month figures. If we suppose the sign to the left of the chuen symbol to be 1 and the number of ahaus to be 9 instead of 10, the reckoning from 1 Ahau 8 Zip will bring us to 1 Ahau 8 Mol, the eighth month, instead of the ninth. This change, however, would not be justified, nor is the change made

by Mr Goodman until he has clearly proved not only that 13 cycles form a great cycle, but also that his arrangement of the chronologic system, which will be referred to further on, is correct.

While the series of the codex which have been given as examples work out correctly, it must be admitted that there are others which can not be successfully traced without arbitrary corrections. Nevertheless, those given, and others rising to the fifth order of units that might be noted, which give correct results, are sufficient to prove the rule. Before we leave the codex, reference will be made to some series with double numbers—that is, one series interpolated with another, one of which Dr Förstemann is inclined to believe is a correction of the other. In these cases the interpolated series, or supposed correction, is in red, the other in black.

As an example, we take the following series from plate 51, using Goodman's names:

	Black	Red	Black	Red
Cycles	1	3	1	2
Katuns	8	4	6	11
Ahaus	4	15	11	10
Chuens	14	12	10	11
Days	0	0	0	0
Day below	12 Lamat		12 Lamat	

Subtracting the black of the right pair from the black of the left, we get the remainders 1, 13, 4, 0; that is, 1 katun, 13 ahaus, 4 chuens, 0 days, making 11,960 days. As no month number is given, we assume 12 Lamat to be the first day (1 Pop) of the year 12 Lamat. Subtracting 364, the remaining days of this year, from 11,960, and dividing the remainder by 365, we obtain 31 years and an overplus of 281 days or 14 months and 1 day. By table 3 we ascertain that 31 years from 12 Lamat bring us to 4 Akbal, the next year being 5 Lamat. By table 1 we ascertain that the first day of the fifteenth month is 12 Lamat, the proper date.

The difference between the red series of the two pairs is 13 katuns, 5 ahaus, 1 chuen, 0 days, equal to 95,420 days. Subtracting from this 5 calendar rounds (94,900 days) 520 days remain. Assuming 12 Lamat to be the first day of the year 12 Lamat, and subtracting 364, the remaining days of this year, from 520, we get 156 days or 7 months and 16 days, to be counted on the next year, which is 13 Ben. This reckoning reaches 12 Lamat, the sixteenth day of the month Mol. The result in both cases is correct, so far as the dates reached are concerned, but the interval between the black series is only 364 days+31

years+281 days, while that between the red series is more than 261 years. It is possible, therefore, that the red, which run through the several columns of this and the following plate, represent an independent series.

There are, however, some interpolations which clearly appear to be corrections; for example, these two series on plate 59:

Black			Red		
8	13	0	6	9	0
6	9	0	2	3	0
2	4	0	4	6	0

The day below each is 13 Muluc. Using the difference between the black series—2 ahaus, 4 chuens, 0 days, equal to 810 days—and taking 13 Muluc, the 2d day of the month Pop in the year 12 Lamat as our starting point (always counting forward when it is not otherwise stated), we reach the day 4 Cauac, 2 Tzec, year 1 Ezanab, not the correct date, as it should be 13 Muluc. Using the difference between the red series—4 ahaus, 6 chuens, 0 days = 1,560 days—assuming the same starting point as before (13 Muluc 2 Pop, year 12 Lamat), and counting forward 1,560 days, we reach 13 Muluc, 2 Tzec, year 3 Lamat. This is a correct result, and indicates that the red numerals were inserted as a correction.

FIG. 16—Part of plate 69, Dresden codex.

On plate 69 we find a series (figure 16) represented by symbols of the same form as those in the inscriptions. The glyphs A1, B1 represent the first date—4 Ahau 8 Cumhu (eighteenth month)—which must fall in the year 8 Ben. At A7, B7 is the next date—9 Kan 12 Kayab. The intermediate counters, comparing with those discovered by Goodman in the inscriptions, are as follows: A5, 15 katuns; B5, 9 ahaus; A6, 4 chuens; B6, 4 days. There are other characters with numerals between the two dates, some of which may be hereafter explained, but none of these, as will be shown hereafter, are customarily counted as part of the time interval.

As I may have occasion to refer again to this series and the exactly similar one on plate 61, I shall only show at present the way in which it is to be used, and call attention to the exact similarity of

the time symbols to those of the inscriptions already figured and those presented farther on.

By referring to *a* and *b* of figure 10, showing the katun symbols, the strong resemblance to glyph A5 of the series now under consideration is at once seen. The resemblance of B5 to *a* and *b*, figure 9, showing the ahau signs, is also apparent, as is A6 to the chuen symbol, figure 8. B6 is the kin or day symbol. Here it seems the numbers denoting days are not attached to the chuen symbol, as is usual in the inscriptions, the day, in the abstract sense, having its appropriate symbol, to which the numerals denoting the number of days are attached.

As the usual order in which the glyphs are to be read is from the top downward, by twos and twos where there are two columns, we will take the first pair, A1 and B1, as the date from which to count. This, as already stated, is 4 Ahau, the 8th day of the 18th month—Cumhu—of the year 8 Ben, which, as will be seen by referring to our table 3, is the forty-seventh year of the cycle of years, or calendar round. Changing these time periods to days—

	Days
15 katuns	108, 000
9 ahaus	3, 240
4 chuens	80
Days	4
The aggregate is	111, 324
Subtract 5 calendar rounds	94, 900
There remain	16, 424

Subtracting from this remainder 17, the number of remaining days in the year 8 Ben, from 4 Ahau 8 Cumhu, and dividing the remainder by 365, we obtain 44 years and 347 days, equal to 17 months and 7 days. Counting forward on table 3, 44 years, we reach 13 Ben, the next year being 1 Ezanab. Turning to table 1 we find that 17 months and 7 days bring us to 9 Kan, 7 Cumhu, instead of 9 Kan 12 Kayab, which is given on the plate. Counting backward from 4 Ahau 8 Cumhu, as the symbols apparently indicate should be done (if the order be as in the inscriptions), results in a still wider variation from the correct date, assuming that the symbols on the plate—which are very distinct and unmistakable—are correct.

If the dates on the plate are correct, the first falls in the year 8 Ben, and the latter in 3 Ben. Counting forward there would be an interval (omitting the calendar rounds) of only 7 years and the fractions of the 2 years in which the two dates fall, manifestly too small for the numeral symbols. Counting backward there would be an interval (omitting the calendar rounds) of 43 years and the fractions of the 2 date-years, making, in all, 16,076 days, or 348 days short of that required by the time symbols after deducting the calendar rounds. As there

are other symbols between the dates with numerals attached, it is possible the explanation needed is found in them. In the parallel passage on plate 61, which appears to have the same beginning and ending date, there is but one dot to the chuen symbol (indicating 1 chuen) and the symbol for 3 days. This gives a total (omitting the calendar rounds) of 16,363 days. But this gives no satisfactory result.

I have dwelt somewhat at length on these series as they are the only ones with two legible dates in the codex which show the higher time periods in symbols. They will serve, however, to show the close relation which this codex bears to the inscriptions, to which we will now turn, beginning with those at Palenque.

Inscriptions at Palenque

Before proceeding with these, in order to show exactly Mr Goodman's method of calculating a series from the inscriptions, I present as an example one which he has fully worked out. This series is found in the inscription of the Temple of the Sun, at Palenque. It will be more critically examined hereafter by comparison with Maudslay's photograph. At present I use Goodman's determination merely for the purpose of illustrating the method of reckoning.

The dates and intervening time periods as he gives them are as follows: 4 Ahau, 8 — (month not identifiable), 16 days, 5 chuens, 18 ahaus, 12 katuns, and 9 cycles, followed by the date 2 Cib, 14 Mol. Reducing these time periods to days, the result is as follows:

	Days
9 cycles	1, 296, 000
12 katuns	86, 400
18 ahaus	6, 480
5 chuens	100
16 days	16
Total	1, 388, 996
Deduct 73 calendar rounds	1, 385, 540
This leaves	3, 456

As the first date can not be fully determined, it will be necessary to count back from the second date—2 Cib 14 Mol, which falls in the year 5 Akbal. Subtracting 154, the preceding days of this year, from 3,456 and dividing the remainder by 365, we obtain 9 years and 17 days. Deducting 5 for the added days, there remain 12 to be counted back on the last month of the year 8 Ben, which we find by counting back on table 3 is the year in which the first date falls. This gives 4 Ahau 8 Cumhu, which is, no doubt, correct, as this date is a very common one on the Palenque inscriptions.

A B C D E F G H I K L

1 2 3 4 5 6 7 8 9

10
11
12
13
14
15
16
17

A PORTION OF THE TABLET OF THE CROSS, PALENQUE.

PHOTOGRAPHED FROM A PLASTER CAST.

Mr Goodman, after ascertaining the number of days in the time periods precisely as they are given above, proceeds as follows:

From these [1,388,996 days] we deduct as many calendar rounds as possible, being 73, or 1,383,540 days, leaving 3,456. From these we take 155, the number of days from the beginning of the year to 14 Mol, that being the only date we are certain of. This leaves 3,301 days. From these deduct all the years possible, being 9, or 3,285 days. There are now but 16 days left. Reckoning back from the end of the year, we find these reach to 8 Cumhu [according to his method of numbering the days of the month], a circumstance that enables us easily to recognize the strange sign as a variant of the symbol for that month. Turning now to the Annual Calendar, we find that 4 Ahau–8 Cumhu occurs on page 7, and, passing over 9 years till we come to page 17, we find that 2 Cib falls on the 14th of Mol in that year. Thus we are satisfied that the strange month sign is a symbol for Cumhu, and that the cycles, katuns, ahaus, chuens, and days represent the period between the two dates, the full reading being: 9–12–18–5×16, from 4 Ahau–8 Cumhu, the beginning of the great cycle, to 2 Cib–14 Mol.

As our process is intended to be independent of Mr Goodman's tables, it is necessary for us to divide by 365 in order to find the intervening years, and to determine the full date including the year, which Mr Goodman fails to do.

TABLET OF THE CROSS

Proceeding now with the Palenque inscriptions. Attention is directed first to that on the so-called Tablet of the Cross, the right slab of which is fortunately safely housed in the United States National Museum. The inscription on this slab is well known through the excellent autotype in Dr Rau's paper entitled Palenque Tablet, but, in order to place the record before the reader in as complete a form as is possible, I have given a copy in figure 17*a*, and a copy of Maudslay's photograph of the left slab in figure plate XL; a drawing of the few characters above the arms of the right priest in the middle space is shown in figure 17*b*.

As this is the most important of all the known Mayan inscriptions, for the purpose of testing Mr Goodman's discoveries, I shall examine it somewhat fully, and to this end give below a list of the dates and series in the order they stand, beginning with the large initial on the left slab. It is necessary, however, first to notice somewhat particularly the initial series of the left slab.

The first character of this series is the large glyph covering spaces A1, B1, and A2, B2. This Mr Goodman interprets as the great cycle, which is equivalent to the sixth order of units. I am inclined to believe this interpretation is correct. The reasons for this belief are the form of the body or chief element of the glyph, which is similar to that of the ahau and katun; and the fact that it always follows in the ascending scale (counting backward or upward) the cycle, there being, so far as known, no exception to this rule in the

initial series. This is shown not only in initial series like the one here represented, where numeral prefixes are face characters, but in a number of others where the ordinary units, balls and lines,

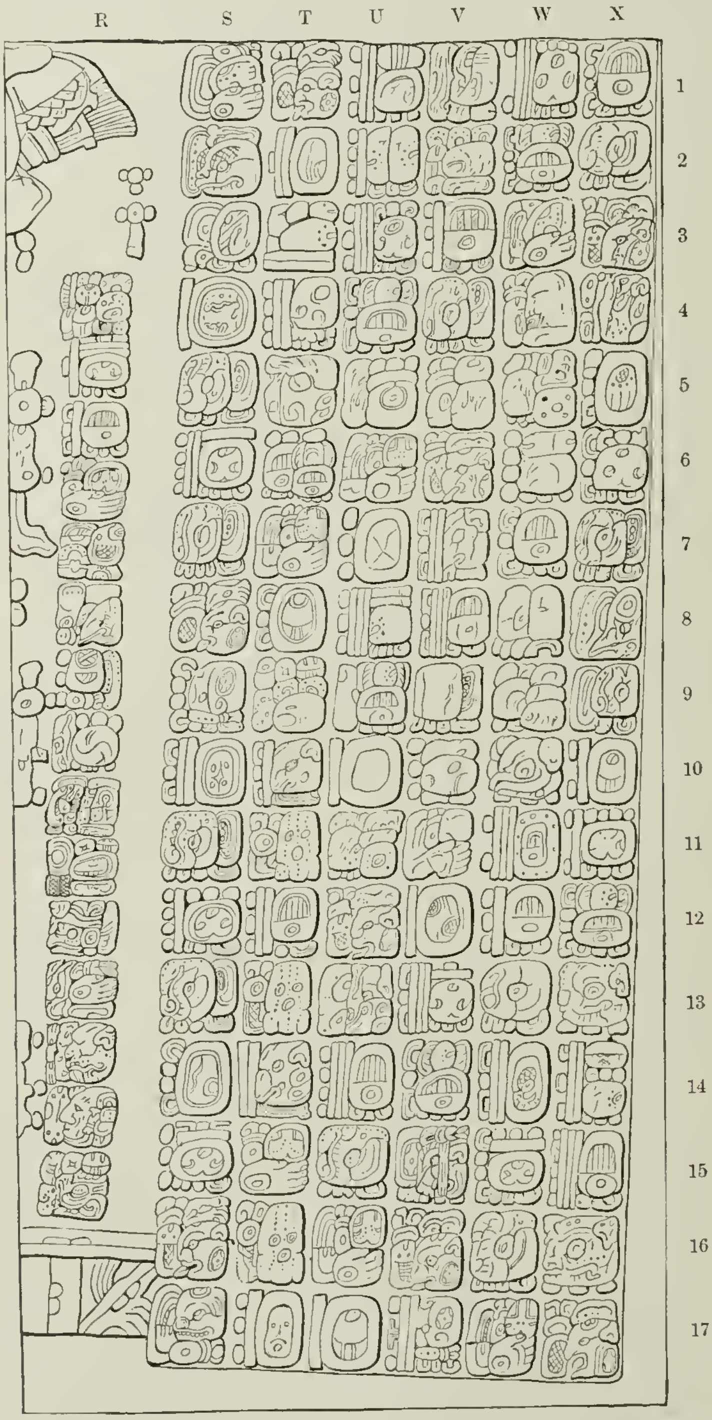


FIG. 17a—Inscription on the right slab of the Tablet of the Cross, Palenque.

are prefixed to the glyphs representing the lower orders (cycles, katuns, etc.). Another reason for this belief is that positive evidence is found in the Dresden codex and in the inscriptions that there is an

order of units above the fifth, or cycle; that is to say, a sixth, or great cycle, as Mr Goodman calls it. This being true, there is every rea-

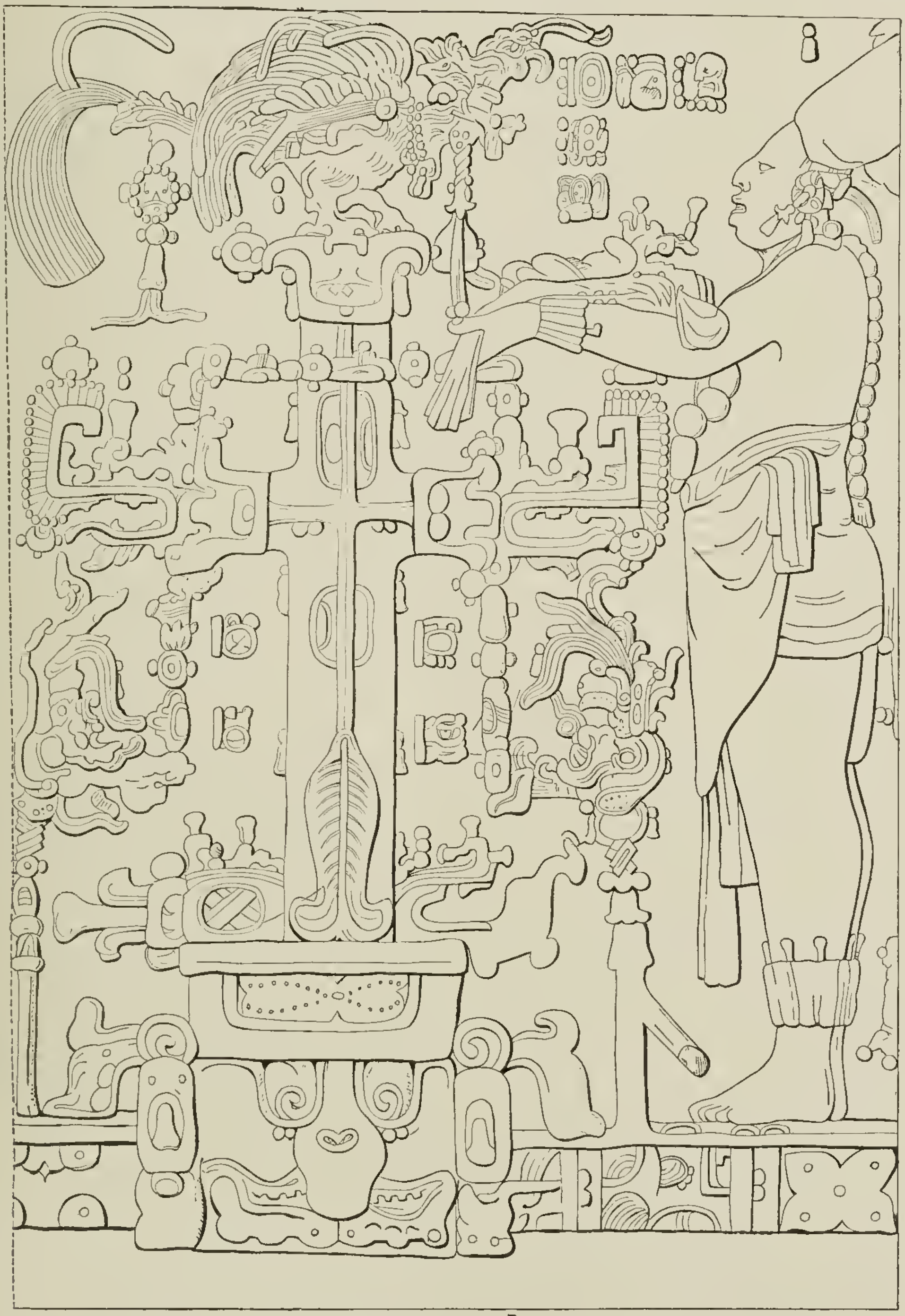


FIG. 17b—Inscription on the middle space of the Tablet of the Cross, Palenque.

son to believe that it would be represented in the inscriptions by a special character.

Examining the seven succeeding double glyphs in the order in which they stand, they are found to be as follows: A3, B3, a face character and

the cycle symbol (see figure 11*a*); A4, B4, a face character and the katun symbol (see figure 10*a*); A5, B5, a face character and the ahau symbol (see figure 9*b*); A6, B6, a face character and the chuen symbol (see figure 8*a*); A7, B7, an unknown character (disc with hand across it) and the symbol for day (kin) in the abstract sense, same as the lower portion of the symbol for the month Yaxkin. At A8, B8, a face character and the symbol for the day Ahau; A9, B9, a face character and the symbol for the month Tzec. These are interpreted by Mr Goodman as follows: "53–12–19–13–4×20—8 Ahau 18 Tzec"; that is to say, the fifty-third great cycle, 12 cycles, 19 katuns, 13 ahaus, 4 chuens, 20 days, to 8 Ahau 18 Tzec. From this it is seen that he interprets the prefixed face characters as numerals, assigning to each a particular number determined by the minor details or otherwise.

Omitting, for the present, consideration of the number given to the great cycle, let us see if there is any reason for believing that he is correct in assigning numeral values to the face characters attached to the time-period symbols, or, as we term them, symbols of the orders of units. Taking the known time-period symbols in this series, observing the regular descending order in which they stand, and being aware of the fact that in several other similar initial series the face characters are replaced by the ordinary numeral symbols (balls or dots and short lines), the evidence seems to justify Mr Goodman's belief. Another strong point in favor of this belief is that at A8, B8, and A9, B9, which contain the symbols for the day Ahau and the month Tzec, we most certainly find a date which could not be complete without attached numerals. As the places of the numerals are filled by face characters, the most reasonable conclusion is that they represent these numerals. The evidence therefore in favor of Mr Goodman's theory seems to justify its acceptance. But here the question arises, what evidence have we that the numbers assigned to these face glyphs are correct? Admitting that they are numeral symbols, it is certain that they do not indicate numbers higher than 20, almost certainly not exceeding 19, as there are other symbols for full count or 20. It is also certain that the one attached to the symbol for the day Ahau does not exceed 13, and that the one attached to the chuen symbol does not exceed 18. We are thus enabled to limit very materially the field of inquiry, but to be entirely satisfactory there must be actual demonstration. If 8 Ahau 18 Tzec could be connected by intervening numbers with a following date this would be demonstration that the numbers given to the date symbols are correct. As will be seen farther on, Mr Goodman connects it by means of series 4 (left slab), given below, with 9 Ik (glyph E9); but the month date reached is 20 Chen instead of 20 Zac, as given in the inscription. While we may accept this as possibly or even probably a correct result, yet it is not demonstration; moreover, (what appears to be an equally probable and more acceptable explana-

tion, as will be shown farther on) by simply adding two days to the first numeral series connection will be made with the date of the third series. There is, however, as will be seen, at least one initial series with face characters in place of numerals where connection is properly made according to Mr Goodman's number with a following date.

As there will be occasion to refer frequently to the series on the different divisions of the tablet we give here a list of these series in the order in which they occur, beginning with the closing date of the initial series on the left slab, the years being added in parentheses. The numeral series are given in cycles, katuns, ahaus, chuens, and days, followed by their equivalent in days placed to the right; and where the sum is greater than a calendar round, the remainder, after subtracting the calendar rounds, is also shown. The term "left slab" (though not strictly correct) is used only to include the six columns at the left; "right slab," the six columns at the right; and "middle space," to include the entire space between the six columns at the left and the six columns at the right. The series as here given are based on inspection:

Left slab

Number of series		Days
	8 Ahau 18 Tzec (2 Akbal)	
	1 Ahau 18 Zotz (2 Akbal)	
1	8 5 0	2,980
	4 Ahau 8 Cumhu (8 Ben)	
2	1 9 2	542
	13 Ik 20 Mol (10 Akbal)	
3	1 18 3 12 0 (274,920 days)	9,200
	9 Ik 15 Ceh (9 Lamat)	
4	2 1 7 11 2 (297,942 days)	13,242
	9 Ik 20 Zac (11 Akbal)	
5	3 6 10 12 2 (479,042 days)	4,542
	9 Ik (no month)	
6	1 6 7 13	9,513
	(The next date comes in the middle space)	

Middle space

	9 Akbal 6 Xul (13 Akbal)	
1	1 8 17	537
	13 Ahau 18 Kankin? or Kayab?	
	3? 4? or 8? ? 3 ? (not determinable)	
2	6 11? 6	2,386?

Right slab

		11......? 20 Pop	
		5 Cimi? 14 Kayab?	
1	1 2 5? 14	....	8,034
		1 Kan 2 Kayab? (5 Akbal?)	
		11 Lamat 6 Xul (10 Akbal)	
2	13 3 9	....	4,749
		2 Caban 10 Xul (10 Lamat)	
3	6 3	....	123
		8 Ahau 13 Ceh (10 Lamat)	
4	1 8 1 18	....	10,118
		3 Ezanab 11 Xul (10 Lamat)	
5	1 16 8? 18?	....	13,138
		5......? (Ahau?) 3......? (Tzec?)	
		5......? 20 Zotz	
6	1 19 6 16	....	14,176
		5 Kan 12 Kayab (12 Ben)	
7	2 2 4 17	....	15,217
		1 Imix 4......? (Zip or Ceh)	
8	1 1 1	....	381
		7 Kan 17 Mol (7 Lamat)	
9	2 8 4 7	....	17,367
		11 Cib? 14 Kayab? (3 Akbal?)	
10	16 or 17? 8 2	....	7,002?
		(No date follows to the close)	

The first day of the left slab—8 Ahau 18 Tzec—has the numbers given in face characters, as has been stated; those given are according to Mr Goodman's interpretation.

The date following number 4, left slab, is corrected by Mr Goodman from 9 Ik 20 Zac to 9 Ik 20 Chen.

Mr Goodman corrects the number of days in the sixth series, left slab, from 9,513 to 9,512.

The month of the date (13 Ahau 18 Xul? or Kayab?) in the middle space, Mr Maudslay, in his drawing (part 5), probably inspired by Mr Goodman, is inclined to give as Kankin, in which he is probably correct. The nearly obliterate glyph which follows he gives as 8—? 3 Kayab. This interpretation is, however, exceedingly doubtful.

Maudslay, in his drawing of the middle space (part 10), gives 13 as the number of chuens in the second series. He is also evidently inclined to give the first date on the right slab (11—? 20 Pop) as 11 Caban 20 Pop; and the second, 5 Cimi 14 Kayab, as is indicated in the preceding list. Though there is some doubt as to the number of

chuens, first series, right slab, this author follows Rau's restoration and gives it as 5, yet it may possibly be 4 or but 3, as the glyph is exactly in the line of a break repaired by Dr Rau.

The number of chuens as well as days in the fifth series of the right slab is uncertain. Maudslay indicates 8 for the former and 18 for the latter, which is apparently correct. The two dates following this series, except the month (20 Zotz) of the second, are almost entirely obliterated. I believe the day of the first to be Ahau. Maudslay does not attempt a restoration, but agrees with my suggestion as to the month. He suggests Caban as the day of the second date. He gives Zip as the month in the date following the seventh series of this slab. The date following the ninth series he gives as 11 Chicchan 13 Yax or Chen, his figure being uncertain. The number of ahaus in the tenth series is left uncertain by him; he apparently prefers 16, though his figure may be construed as 18. The three lines (15) are distinct in the inscription, but the number of balls forming the fourth line is uncertain; the number seems to me to be 16 or 17.

In referring to the inscription, Rau's scheme, given on page 61 of his Palenque Tablet—to wit, letters above for each column and numbers at the sides for the lines—will be followed here (not Maudslay's), it being remembered that the columns, where there are more than one, are to be read two and two from the top downward, single columns from the top downward, and single lines from left to right.

Referring now to the left slab, we will first point out the location in the inscription of the glyphs denoting the several dates and numeral series, the latter being reversed to agree with the order in which they come in the inscription, the first date—8 Ahau 18 Tzec—being that with which the initial series terminated.

Series	
	8 Ahau (A8 B8) 18 Tzec (A9 B9)
	1 Ahau (A16) 18 Zotz (B16)
First	0 days 5 chuens (D1) 8 ahaus (C2)
	4 Ahau (D3) 8 Cumhu (C4)
Second	2 days 9 chuens (D5) 1 ahau (C6)
	13 Ik (C9) 20 Mol (D9)
Third	0 days 12 chuens (D13) 3 ahaus (C14) 18 katuns (D14) 1 cycle (C15)
	9 Ik (E1) 15 Ceh (F1)
Fourth	2 days 11 chuens (E5) 7 ahaus (F5) 1 katun (E6) 2 cycles (F6)
	9 Ik (E9) 20 Zac (F9)
Fifth	2 days 12 chuens (E10) 10 ahaus (F10) 6 katuns (E11) 3 cycles (F11)
	9 Ik (F12) no month given
Sixth	13 days 7 chuens (F15) 6 ahaus (E16) 1 katun (F16)

We begin, therefore, in our attempt to trace the series and connect the dates with 8 Ahau 18 Tzec (as Mr Goodman interprets the numeral face characters), which falls in the year 2 Akbal. As it is followed by another date (1 Ahau 18 Zotz) without any recognized

intervening numeral intended to be used as a connecting series, we must assume that if it is connected with any of the following dates it must be by means of one of the series coming after the second date. Mr Goodman does not begin his attempts at tracing the connections in the inscription on this slab with the first date, but, after noticing the initial series, and taking 1 Ahau 18 Zotz as his starting point, says (page 135):

> After three glyphs, which are probably directives stating that the computation is from that date, there is a reckoning of 8–5×20 [that is, 8 ahaus 5 chuens 20 days], with the directive signs repeated, to 4 Ahau 8 Cumhu [the third date given above]. * * * This reckoning is a mistake. It should be either 6–14×20, the distance from 8 Ahau 18 Tzec to 4 Ahau 8 Cumhu, or 6–15×20, the distance from 1 Ahau 18 Zotz—more likely the latter, as it will presently be seen that other reckonings go back to that date.

Before referring to Mr Goodman's suggestions, we find by trial that this first date (8 Ahau 18 Tzec, year 2 Akbal) will not connect with any of the dates on the left slab, nor middle space, by either of the numeral series as given. If, however, we add two days to the first numeral series, making it 2,982 days, and count forward from 8 Ahau 18 Tzec, we reach 13 Ik 20 Mol in the year 10 Akbal, the date following the second series. This, it is true, skips over the immediately following date (4 Ahau 8 Cumhu, year 8 Ben), but if we subtract the second numeral series (542) from the first (2,982, as corrected) the remainder, 2,440, counting forward from the same date, will bring us exactly to 4 Ahau 8 Cumhu 8 Ben. Are these two coincident correct results to be considered accidental? They might be but for the additional fact that if 542 be subtracted from the sum of the first three series (first, second, third) with added two days to the first, the remainder, counting forward from 8 Ahau 18 Tzec 2 Akbal, will reach 9 Ik 15 Ceh 9 Lamat, the date following the third numeral series.

Turning now to Mr Goodman's explanation of the first series and the accompanying dates, I notice first the fact that here as elsewhere he interprets what I consider the symbol for naught (0) as equivalent to 20; thus the number of days of the first series instead of 2,980 would be, following his explanation, 3,000—that is to say, the numeral series, as he gives it, is 8 ahaus 5 chuens 20 days, my interpretation being 8 ahaus 5 chuens 0 days. The chuen symbol here is of the usual form, that shown in figure 1 *a*; the ahau is a face form similar to that shown at figure 2 *b*. That there is a mistake here, as Mr Goodman asserts, is evident, if the two dates given, 1 Ahau 18 Zotz and 4 Ahau 8 Cumhu, are to be connected by the intermediate time periods. As 1 Ahau 18 Zotz falls in the year 2 Akbal, and 4 Ahau 8 Cumhu in the year 8 Ben, the interval is six years and the fractional days of the two years

(2 Akbal and 8 Ben), the total, in days, being 2,825, whereas the intermediate time periods, as interpreted by Mr Goodman, give 3,000, or, omitting the 20 days, according to Maudslay's interpretation of the symbol, which appears to be correct, 2,980 days. It is apparent therefore that there is some mistake here—that is, supposing the theory that the two dates are intended to be connected by the intermediate time symbols be true.

Mr Goodman suggests two ways of making the correction—first, by assuming 8 Ahau 18 Tzec to be the date from which to count, and changing the intermediate numeral series from 8 ahaus 5 chuens to 6 ahaus 14 chuens, thus making two radical alterations; in other words, a new numeral series to fit the case. This he obtains by subtracting the initial series as he has given it, from the 13 cycles composing his fifty-third great cycle, thus—

13— 0— 0— 0—0
12—19—13— 4—0
———————
6—14—0

His other method is to change the intermediate time periods or numeral series to 6 ahaus 15 chuens—which is also making a new series—and to count from 1 Ahau 18 Zotz.

In making these proposed changes Mr Goodman seems to drop out of view his 20 days, as in fact he does throughout in his calculations. He gives the full count—20 for days, ahaus, and katuns, and 18 for chuens—in noting the numeral series, but appears to treat them as naughts in his calculations. This is evident from the numbers he gives in the present instance. As conclusive evidence on this point it is only necessary to refer to the preface to his "perpetual chronological calendar" (op. cit., not paged), where he says of the series 9—15—20—18×20, "there are no days, chuens, or ahaus in this date." Mr Maudslay, in his illustration of Goodman's method of interpretation before the Royal Society of England, June 17, 1897, in which he uses a newly discovered inscription (see figure 20), counts the character at the side of a chuen symbol (C1), precisely like that attached to our chuen, as equivalent to naught. In the case he refers to there are two lines above the symbol, counted as 10 chuens. Speaking of it he says:

> C1 is the chuen sign with the numeral 10 (two bars=10) above it and a "full count" sign at the side. Whether the 10 applies to the chuens or days can only be determined by experiment, and such experiment in this case shows that the reckoning intended to be expressed is 10 chuens and a "full count" of days—that is, for practical purposes 10 chuens only, for as in the last reckoning, when the full count of chuens was expressed in the ahaus, so here the full count of days is expressed in the chuens.

In other words, that the character at the side simply means that no

days are to be counted, and so his figures giving the number of days show. But this, as has been shown, will not suffice to correct the mistake in our example. However, a very slight change, as I have shown, which Mr Goodman failed to find, which is simply adding 2 days to the time periods, will suffice to bring the series into harmony with the theory, and at the same time to verify his determination of the face numerals attached to the terminal date of the initial series—8 Ahau 18 Tzec (year 2 Akbal).

Although the initial series will be discussed farther on, it will perhaps be best to indicate here the probable processes by which Mr Goodman reached his conclusions in regard to the series now under consideration.

According to the system which he has adopted and which he claims was the chronologic system of the inscriptions, 13 cycles, or units of the fifth order, make 1 great cycle, or 1 unit of the sixth order, and 73 great cycles complete what he terms the "grand era." As this system will be more fully explained farther on, it is only necessary to state here that he concludes from his investigation that the dates found in the inscriptions all fall in the fifty-third, fifty-fourth, and fifty-fifth great cycles. As these are taken by him to be absolute time periods, each begins with its fixed and determinate day; in other words, there is no sliding of the scale. According to this scheme the fifty-third great cycle began with the day 4 Ahau 8 Zotz, the fifty-fourth with 4 Ahau 8 Cumhu, and the fifty-fifth with the day 4 Ahau 3 Kankin, these dates following one another at the distance of one great cycle apart, which is correct on his assumption that 13 cycles make one great cycle, a conclusion which I shall have occasion to question.

Now, it is apparent that he assumes that 4 Ahau 8 Cumhu, the day following the first numeral series noted above, is the beginning day of his fifty-fourth great cycle. This being assumed, it follows that the preceding dates, 8 Ahau 18 Tzec and 1 Ahau 18 Zotz (which precedes the former in actual time by precisely one month), must fall in his fifty-third great cycle; and as the former (8 Ahau 18 Tzec) is the terminal date of the initial series, therefore this initial series goes back to 4 Ahau 8 Zotz, the beginning day of the fifty-third great cycle. As the time to be counted back from 4 Ahau 8 Cumhu to reach the closing date of the initial series is, according to the first numeral series, 8 ahaus, 5 chuens, 0 days, or 2,980 days, it must necessarily fall in the last katun of the fifty-third great cycle, which, according to his peculiar method of numbering periods, will be the 19th katun of the twelfth cycle. Counting back into this katun (using his tables), 8 ahaus and the 5 months carries us into the ahau beginning with 1 Ahau 8 Uo, as the only day Ahau of this period falling in the month

Tzec—which the inscription requires—is 9 Ahau 8 Tzec, which requires a numeral series of 3,180 days, or 8 ahaus 15 months. As Mr Goodman concludes that the face numeral prefixed to the symbol for the month Tzec should be interpreted 18, the nearest position in which a day Ahau the 18th of the month Tzec can be found, is in the thirteenth ahau of this katun. From this date to 4 Ahau 8 Cumhu is 6 ahaus 14 chuens; hence his proposed change in the numeral series.

The question therefore to be answered before we can give full assent to his conclusion is this, Are his renderings of the face characters reliable? That they represent numbers seems to be evident, as I show elsewhere, but the data presented in his work are not entirely satisfactory. That the initial series now under consideration contains one or more cycles, one or more katuns, one or more ahaus, and one or more chuens—or, as I term them, units of the fifth, fourth, third, and second orders—is certain; and that the terminal date is a day Ahau in the month Tzec is also true if the inscription be correct. The language used by Mr Goodman in defining the face numerals indicates that he has relied to some extent on his system of interpretation rather than on the details of the glyphs in determining their value, but this can be decided only by a careful examination of all the inscriptions in this respect, which it is my purpose to make in a supplemental paper when Maudslay's figures of the Quirigua inscriptions are received. When the count can be based on the glyphs his scheme will not interfere with a correct count. For example, 4 Ahau 8 Cumhu of this series may or may not be the first day of his fifty-fourth grand cycle, for in either case the count will bring the same result; nor will the fact that there are probably 20 cycles to the great cycle change the result. However, the subject will be further discussed when we consider the initial series, and for the present we will accept Mr Goodman's determination of the face numerals with the above implied reservation.

I have dwelt somewhat at length on this example in order to show some of the methods of determining positively that there is an error in the original, and the seeming impossibility in some cases of correcting it. Occasionally this can be done by means of a connected preceding or following series; or, where a single minor change will bring all the members of the series into harmony, this change is sometimes justified, but such changes as those suggested above by Mr Goodman in regard to the example under consideration, especially where the value of a sign is also in dispute, are not warranted without proof.

The next date is found in glyphs C9, D9, and is 13 Ik —? Mol. Here the numeral attached to the month is not a regular number symbol (dots and bars) and is interpreted 5 by Mr Goodman. In this I am inclined to think he is wrong, as the symbol appears to be the

same as that found in glyph F9, which he interprets 20. His description of the series is as follows:

> Then [after 4 Ahau 8 Cumhu] follows another reckoning of 1–9×2 [1 ahau, 9 chuens, 2 days], succeeded by five unintelligible glyphs, to 13 Ik, 5 Mol. The computation and the 13 Ik are right, but the month should be 20 Chen, as will be seen by reference to the annual calendar. It will be evident pretty soon that the sculptors got their copy mixed up. The 5 Mol should have gone with another date (p. 135).

The intermediate time periods are 1 ahau (of the usual form, *a*, figure 9), 9 chuens, and 2 days:

	Days.
1 ahau	360
9 chuens	180
Days	2
Total	542

As the first date is uncertain, unless the explanation given above be accepted, we must count back from 13 Ik 20 Mol, which falls in the year 10 Akbal. I use 20 Mol, as I believe 20 to be the true interpretation of the unusual number symbol, and it is really that adopted by Mr Goodman in his calculation, though not expressed. As 20 Mol is the one hundred and sixtieth day of the year, and the count is backward, we subtract this from 542, and divide the remainder by 365, which gives 1 year and 17 days; this brings us to the year 8 Ben. Deducting 5 for the intercalated or added days, and counting back 12 days from the end of the month Cumhu, we reach 4 Ahau, the eighth day of the month Cumhu, proving that this terminal date of the preceding series is correct and that the error of that series must be in the initial date or in the numerals attached to the intermediate time periods. This result is in fact the same as that obtained by Mr Goodman, who commences his count of the days of the month with 20, transferring the last days of the columns in our table 1 to the first place, as is shown in table 4, given below, which is simply a condensation of his "Archaic annual calendar," where each of the fifty-two years is written out in full.

TABLE 4

Ik years	Manik years	Eb years	Caban years	Day numbers													Days of the month
Ik	Manik	Eb	Caban	1	8	2	9	3	10	4	11	5	12	6	13	7	20
Akbal	Lamat	Ben	Ezanab	2	9	3	10	4	11	5	12	6	13	7	1	8	1
Kan	Muluc	Ix	Cauac	3	10	4	11	5	12	6	13	7	1	8	2	9	2
Chicchan	Oc	Men	Ahau	4	11	5	12	6	13	7	1	8	2	9	3	10	3
Cimi	Chuen	Cib	Imix	5	12	6	13	7	1	8	2	9	3	10	4	11	4
Manik	Eb	Caban	Ik	6	13	7	1	8	2	9	3	10	4	11	5	12	5
Lamat	Ben	Ezanab	Akbal	7	1	8	2	9	3	10	4	11	5	12	6	13	6
Muluc	Ix	Cauac	Kan	8	2	9	3	10	4	11	5	12	6	13	7	1	7
Oc	Men	Ahau	Chicchan	9	3	10	4	11	5	12	6	13	7	1	8	2	8
Chuen	Cib	Imix	Cimi	10	4	11	5	12	6	13	7	1	8	2	9	3	9
Eb	Caban	Ik	Manik	11	5	12	6	13	7	1	8	2	9	3	10	4	10
Ben	Ezanab	Akbal	Lamat	12	6	13	7	1	8	2	9	3	10	4	11	5	11
Ix	Cauac	Kan	Muluc	13	7	1	8	2	9	3	10	4	11	5	12	6	12
Men	Ahau	Chicchan	Oc	1	8	2	9	3	10	4	11	5	12	6	13	7	13
Cib	Imix	Cimi	Chuen	2	9	3	10	4	11	5	12	6	13	7	1	8	14
Caban	Ik	Manik	Eb	3	10	4	11	5	12	6	13	7	1	8	2	9	15
Ezanab	Akbal	Lamat	Ben	4	11	5	12	6	13	7	1	8	2	9	3	10	16
Cauac	Kan	Muluc	Ix	5	12	6	13	7	1	8	2	9	3	10	4	11	17
Ahau	Chicchan	Oc	Men	6	13	7	1	8	2	9	3	10	4	11	5	12	18
Imix	Cimi	Chuen	Cib	7	1	8	2	9	3	10	4	11	5	12	6	13	19

It will be seen from this that 13 Ik, the last day of the month Mol (year 10 Akbal) in our table 1, by the change made by Mr Goodman becomes the 20th day of the month Chen, which is in fact the beginning day of this month, and would in all ordinary calculations be counted the first, or 1.

Although the numbering of the days of the month and of the days is not changed by this transposition, it does make a change in two important respects. First, the days which would be last in the month, if the count of the days of the month began with 1, become the beginning days of the following month, though counted as the 20th by Goodman's method. Second, the position of the years in the 52-year period is changed. For example, the year 10 Akbal of the series examined, which will—as can be seen by reference to table 3—be the 49th year of the 52-year cycle, becomes the 9th by Goodman's method.

In the preface or preliminary remarks to his Archaic Annual Calendar, this author states as follows:

> I have put Ik at the head of the days because it is nearest to Kan of any of the Archaic dominicals, and because the Oaxacan calendar shows a tendency toward retrogression in the order of the days. There is no good reason, however, why any of the other dominicals may not have been the first. In fact the frequent and peculiar use of Caban in the inscriptions and its standing as the unit of the numeral series constituted by the day symbols would appear to go far toward justifying an assumption that it was the initial day; but the former circumstance may be only a chance happening, and the latter may attach to the remote pre-Archaic era when the year began with the month Chen; so that neither of these considerations, nor the significant recurrence of Manik in certain places, has had weight enough to induce me to change the order originally adopted; nor will it be worth while to alter it until some style of reckoning from the beginning of the annual calendar is discovered not in harmony with the present arrangement.

In regard to these statements, it may be affirmed that the reason given for placing "Ik at the head of the days" is wholly insufficient, as it is not, in fact, nearest Kan of any of the Archaic dominicals, being nearer to Akbal, which certainly was a dominical, than to Kan; nor, in fact, would this be any reason for the change were it true. Second, as he begins the count of the days of the month with 20, it is in fact not first in the count. It is proper, however, to add here that if Dr Brinton (The Native Calendar, p. 22) has interpreted correctly his authorities, Ik was the initial dominical day in the Quiche-Cakchiquel calendar, though it must have been in comparatively recent times, as will appear from what follows farther on. Mr Goodman's remark that "there is no good reason, however, why any of the other dominicals may not have been first" is certainly correct. But this statement involves the correctness of his entire calendar system so far as the determination of the position of dates is concerned. It is true, as he states in the paragraph next below that quoted, that

"for all ordinary purposes the point of beginning is of no importance, since the annual calendar is only an orderly rotation of the days until each of them with the same numeral has occupied the seventy-three places allotted to it in the year," if "all ordinary purposes" be limited to finding the beginning, closing, and length of periods without regard to the absolute position in the higher Mayan time periods.

To illustrate, I take the last day of the series just examined. If the dominical days be Akbal, Lamat, Ben, Ezanab, in the order given, as first declared by Seler, this day will be 13 Ik, the 20th day of Mol in the year 10 Akbal, and the forty-ninth year of the 52-year period, where the count is by true years, and the 52-year period begins with the year 1 Akbal. According to Mr Goodman's system, using Ik, Manik, Eb, and Caban as the dominical days in the order given (20 Ik being first in the 52-year period), counting the beginning day of the months as the 20th, it would be (though absolutely the same day in time) the 20th day of the month Chen in the year 9 Ik, the 9th year of the 52-year period.

It is undoubtedly true that if the days were written out in proper succession with the proper numbers attached and the months properly marked, as in my Maya Year, we might, if the series should be made of sufficient length, begin the cycle at any point where we could find a day numbered 1 and standing as the first (beginning) day of the month Pop. But the cycles of years beginning at different points would not coincide with one another unless they were exactly 52 years, or a multiple of 52 years, apart.

As the system has, for the periods above the year, no fixed historical point as a basis or guide, the dates are only relative, that is to say, a date though readily located in the 52-year period, unless connected with some determinate time system, may refer to an event that occurred 200, 500, or 5,000 years ago; in other words, is but a point in each of an endless succession of similar series.

It is possible, after all, that Goodman and I are both in error as to the initial year of the 52-year period, though this will in no way affect the calculation of series and determination of dates. The result in these calculations will be the same with any year as the initial one, provided that the regular order of succession be maintained. If the ordinary calendar among enlightened nations had nothing fixed by which to determine relative positions in time, our centuries might be counted from any one selected year, and all calculations made would be relatively correct.

Although Mr Goodman's computations may be, as we shall doubtless find them as we proceed, usually correct, yet there is, if I read him aright, one radical error in his theory. He has taken the apparatus, the aid, the means which the Mayas used in their time counts as, in reality, their time system. In other words, he has taken the

calculation as the thing calculated. He makes the statement, already quoted:

> It was taken for granted that a year of 365 days must necessarily enter into the reckoning; whereas, the moment the Mayas departed from specific dates and embarked upon an extended time reckoning, they left their annual calendar behind and made use of a separate chronological one.

It is the error made in this statement that vitiates the entire stupendous fabric he has built upon it, though all of his computations may be correct so far as calculation is concerned. The Maya, in order to calculate time, had necessarily, just as any other people, to use some system of notation. Maudslay, though usually so carefully conservative, seems to have been led astray in this matter, as he remarks:

> All the dates and reckonings found on the monuments which can be made out by the aid of these tables are expressed in ahaus, katuns, etc., and not in years; but Mr Goodman maintains that the true year was known to the Mayas, and that it is by the concurrent use of the chronological and annual tables that the dates carved on the monuments can be properly located in the Maya calendar.

Dr Förstemann and Dr Seler seem also to have missed the true signification of this time counting. If the former intended to be understood, in suggesting an "old year" of 360, that this number of days was at an early period in the history of the Mayan people actually counted as a year, as seems to be a fair inference from his language, it follows as a necessary consequence that the years and also the months always commenced with the same day, though not with the same day-number (Zur Entzifferung der Mayahandschriften, IV, 1894, and elsewhere). Although Dr Seler distinguishes the 360 days from the true year of 365 days, he alludes to it as a real time period. Speaking of the "katun," he says:

> And hence the discussion—upon which many profitless papers have been written—whether the katun is to be considered 20 or 24 years. The truth is, it consists neither of 20 nor of 24 years—the years were not taken into account at all by the old chroniclers—but of 20 x 360 days.

His katun was therefore 7,200 days, the same as that afterwards adopted by Mr Goodman.

As a Mayan date is properly given when it includes the day and day number, and the month and day of the month, this determines the year in the system and the dominical day. As dates are found in the oldest inscriptions and in the Dresden codex, the oldest, or one of the oldest codices, and these dates show beyond question a year of 365 days, and hence a four-year series, there is no reason for believing that there are allusions, either in the inscriptions or codices, to a year of 360 days. The simple and only satisfactory explanation is that the 360 is a mere counter in time notation.

It would seem, therefore, that Mr Goodman has taken the system of notation in use among the Maya—their orders of units—to be, in reality, their chronological system. It would be just as true to say that the system of notation adopted by most enlightened people—the units, tens, hundreds, thousands, millions, etc., used in calculating periods of time—is, in fact, their time system. The Maya never left their annual calendar behind them when embarking upon extended time reckoning, a fact which is overwhelmingly proved by the constant reference to dates in the codices and inscriptions. The only proof furnished by Mr Goodman as to the reality of his discoveries is based upon this fact. The Maya time counts have only dates of the calendar system in view. Of course the mystical or ceremonial use of the 260-day period is not denied. Were it otherwise, their counting up of high numbers would have no more meaning than the figuring of schoolboys to see what great numbers they could reach. However, additional evidence of the correctness of this assertion will become more apparent when I come to the examination of the characters and numbers which Goodman assigns to his highest Mayan time periods. But in the meantime, though pointing out his fundamental error in this respect, we must not lose sight of his real and important discoveries, which must have a material bearing on all future attempts at interpretation of the codices and inscriptions.

Continuing our examination of the inscription of the Palenque Tablet of the Cross, and starting now from our last date, 13 Ik 20 Mol, in the year 10 Akbal (as I have interpreted it), we take up the succeeding series, explained by Mr Goodman as follows:

> After half a dozen glyphs, unintelligible further than like most intervening characters they are to be found elsewhere in the lists of period symbols, there is another reckoning—1–18–3–12×20 from the preceding date to 9 Ik 15 Ceh [3 left slab]. This is correct, and in connection with the previous reckoning it proves conclusively that the preceding date should be 13 Ik 20 Chen (p. 135).

This "reckoning" signifies 1 cycle, 18 katuns, 3 ahaus, 12 chuens, and 20 days. Here, however, occurs again at the left of the chuen symbol the same character as that at the left of D1 mentioned above, which we counted as 0 instead of 20, as interpreted by Goodman. We count it as 0 in this instance also:

	Days
1 cycle	144, 000
18 katuns	129, 600
3 ahaus	1, 080
12 chuens	240
Days	0
	274, 920

Following our own count as given above from 20 Mol, let us see what the result will be. From the total (274,920 days) we subtract 14

calendar rounds or 265,720 days, leaving a balance of 9,200 days. Subtracting from this 205, the remaining days of the year 10 Akbal, and dividing the remainder by 365, we obtain 24 years and 235 days, or 11 months and 15 days. Referring to table 3, and counting forward 24 years from 10 Akbal and passing to the year following, we reach 9 Lamat. By table 1 we find that the 15th day of the 12th month of the year 9 Lamat is 9 Ik, the 15th day of the month Ceh. This is correct, and proves (what Mr Goodman also claims for his count) that our decision as to the dates and the naught symbol is also correct. We pass to the series which follows (4, left slab). This is described by Mr Goodman thus:

> Six unintelligible glyphs follow; then there is a reckoning of 2–1–7–11×2, succeeded by four directive signs, to 9 Ik 20 Zac. I call attention to the directive signs. Two of them are the bissextile character and its coadjutor, which I think are employed in Palenque to denote different numbers of calendar rounds. These should denote fifteen, if intended to indicate the length of the reckoning; if to express an additional period, it is uncertain how many. The other two directive signs are identical with two of those used after 1 Ahau 18 Zotz to show the reckoning is from that date. This reckoning is also from that date; hence the glyph consisting of a bird's head and two signs for 20 over it probably indicates an initial date, or a substitute for it, as 1 Ahau 18 Zotz would appear to be in this case. The month symbol is wrong here also. It should be Yax instead of Zac.

The next date is at E9, F9, which, as there given, appears to be 9 Ik 20 Zac, and the series is 2 days, 11 chuens, 7 ahaus, 1 katun, and 2 cycles at E5 to F6, the symbols being of the usual form. As this will not connect 9 Ik 20 Zac with the preceding date, 9 Ik 15 Ceh (E1 F1), we will reckon from 1 Ahau 18 Zotz (A16 B16), as Mr Goodman suggests. This date falls in the year 2 Akbal.

The count 2–1–7–11×2, when converted into days, is as follows:

	Days
2 cycles	288,000
1 katun	7,200
7 ahaus	2,520
11 chuens	220
2 days	2
Total	297,942

Subtracting from this 15 calendar rounds—284,700 days—we get 13,242 days. Subtracting from this 287, the remaining days of the year 2 Akbal, after 1 Ahau 18 Zotz, and dividing the remainder by 365, we obtain 35 years and 180 days, or 9 months. Counting 35 years from 2 Akbal, on table 3, we reach 11 Ezanab. As the next year will be 12 Akbal, by counting on table 1 nine months in this year, we reach 9 Ik, the 20th day of the month Chen. This corresponds with the inscription except as to the month, which is 20 Zac. The count as given by Mr Goodman is 20 Yax, which is identical in his system with 20 Chen according to the system I am following. His

suggestion, therefore, that the reckoning is to be from 1 Ahau 18 Zotz appears to be correct; at least it connects this date with that following the series, when allowance for the correction mentioned is made.

Although this irregularity, of taking the series step by step from a given date for a time and then skipping back to another date as the starting point, arouses suspicion of something wrong in the proceeding, yet it occurs more than once both in the inscriptions and codices, and hence is not necessarily an evidence of error. The two dates which precede the first series indicate two points from which the count in some of the following series is to begin. Did we fully understand the intermediate glyphs, we should probably find this explained; at any rate we must follow at present what seems to be the most probable rule, trusting that future investigation may correct any errors into which we have fallen. Mr Goodman, who has sought to learn the meaning of what he calls directive signs, says in regard to those connected with this series, "Two directive signs are identical with two of those used after 1 Ahau 18 Zotz to show the reckoning is from that date." There is, however, but one that is similar, and it is an oft-repeated glyph. At any rate the proper result appears to be 9 Ik 20 Chen in the year 12 Akbal, as in no possible way can 9 Ik 20 Zac, which falls in the year 11 Akbal, be reached; and the day 20 Zac in the year 12 Akbal is 3 Ik, whereas the plan of the series appears to require 9 Ik. That the count should be from 1 Ahau 18 Zotz—that is, 1 month back of 8 Ahau 18 Zotz—or that the 11 chuens in the numeral series should be 10, is shown in another way, thus: To obtain the lapse of time from the last preceding date, 9 Ik 15 Ceh, we deduct 9,200 days (third series) from 13,242 (fourth series), and from this deduct 2,982 (first series), over which, as we have seen, the count skipped; this leaves 1,060 days. Counted forward from 9 Ik 15 Ceh (year 9 Lamat), this number of days brings us to 3 Ik 20 Yax in the year 12 Akbal, just 1 month later than 20 Chen. This calculation is based on 8 Ahau 18 Tzec as the starting point; hence we must count from 1 Ahau 18 Zotz, or assume that the 11 chuens in the numeral series should be 10. That the 20 Zac is wrong seems to be evident. Basing the count on 4 Ahau 8 Cumhu and 8 Ahau 18 Tzec will bring the same result, as will be seen by subtracting 2,440 from 13,242 and counting forward from the former.

The series (5 of the left slab) following the last date—9 Ik 20 Chen—as corrected, is described by Mr. Goodman as follows: "The reckoning which follows, 3–6–10–12×2, from the beginning of the great cycle is correct. It is here the 5 Mol should have gone, that being the month date." These number symbols, 3 cycles, 6 katuns, 10 ahaus, 12 chuens, 2 days, which amount to 479,042 days, are followed at F12 by 9 Ik without any accompanying month symbol. The cycle and ahau symbols in this instance are face forms. By assuming as the month

date 5 Mol, and counting back, Mr Goodman reaches 4 Ahau 8 Cumhu—D3, F4. That the count backward from 9 Ik 5 Mol will reach 4 Ahau 8 Cumhu is true, but here again is leaping over series as though they were inserted without plan or system. Moreover, Mr Goodman's remark that the count reaches back to the beginning of the great cycle appears to be inconsistent with his own figures unless we change his "full counts" to naughts. The initial series which he gives is, as has been shown, 53–12–19–13–4×20 to 8 Ahau 18 Tzec. Now, from this date—8 Ahau 18 Tzec—to 4 Ahau 8 Cumhu, according to his own count (page 135) is 6–14×20. Let us add these together.

Cycles	Katuns	Ahaus	Chuens	Days
12	19	13	4	20
		6	14	20
13	0	0	2	0

This reckoning runs back beyond the beginning of his 13th cycle, and hence, by his method of stating series, past the beginning of his great cycle, by two months, using his own figures. If the 20 days in the two series had been counted as 0, his calculation would have brought him to the beginning of a great cycle according to his scheme. Although, as has been stated, he does not use the full counts in his calculations, reference is made here to his method of stating numeral series in order to guard students from being led into error thereby. In every case where he uses 20 for days, ahaus, or katuns, and 18 for chuens, the true figure is 0.

Another fact to be taken into consideration in deciding whether the evidence in the last count is satisfactory is that, as Ik might fall on the 5th, 10th, 15th, or 20th of the month and any one of the months might be chosen, there are 72 (4×18) variations to be tried to bring it into accord with the preceding date. If it could be connected by a following numeral series with some other date, the evidence would then be entirely acceptable, but this does not appear to be the case.

However, I am not entirely satisfied with the result in this case, as the omission of the month date seems to imply that the 9 Ik is to fall on the 20th day of the month. If we follow the same rule as in the two preceding series, and subtract the 4th (297,942 days) from the 5th (479,042), and from the remainder the first numeral series, taking off the one month as before, and counting from the last preceding date—9 Ik 20 Chen as corrected—we reach 9 Ik 20 Mol, year 6 Akbal. Or, subtracting the first series from the 5th (the 4,542) and counting forward from 1 Ahau 18 Zotz, we reach 9 Ik the 20th day of the month by dropping the same troublesome one month. These facts lead me to suspect that the true solution of the problem has not yet been reached.

Following the last date, after some five unknown glyphs are passed, comes, at F15, F16, the numeral series (6, left slab) 13 days, 7 chuens,

6 ahaus, 1 katun, equal to 9,513 days. As no date appears in the remainder of the columns of this left slab, the question arises, Is the left inscription complete in itself and this the close, or is there connection with that of the middle space or right slab? This question will be discussed a little farther on. However, it may be stated here that by using the last (tenth) numeral series on the right slab (7,002 ? days) and counting forward from 1 Ahau 18 Zotz 2 Akbal, of the left slab, we reach 9 Ik 5 Mol 8 Ezanab, of the fifth series of the left slab; but this would seem to be an accidental coincidence.

As additions to the evidence already adduced in regard to the use of face characters to represent numbers, attention is called to others on this slab in regard to which there can be no question. One of these representing the ahau, or third order of units, is seen at F10; one denoting the cycle, or fifth order of units, at F11; another representing the ahau is seen in front of the anklets of the left priest at L13, and another denoting the katun or cycle is under the feet of the left priest.

The inscription in the middle space begins with the date 9 Akbal 6 Xul—including the two glyphs G and H above the head of the left priest. These are distinct, and are probably to be accepted as correct, as the inscription in the middle space of the Tablet of the Sun, which appears to be similar in several respects to that on this tablet, begins with precisely the same date, in the same relative position. The numeral series (1) which follows consists of glyphs L12 and L13, immediately in front of the anklets of the left priest. These are 17 days, 8 chuens, 1 ahau, which equal 537 days. It is possible, however, that the large glyph on which the left priest is standing, which indicates 9 katuns or 9 cycles, is to be included in this series. If they are katuns, then the total number of days is 65,337, from which deducting three calendar rounds (56,940 days), leaves 8,397 days to be counted; if they are cycles, the total number of days is 1,296,537, from which deducting 68 calendar rounds (1,290,640), leaves 5,897 days. The date which follows at glyph L14 is 13 Ahau and apparently 18 Kayab ? or Xul ? or possibly Kankin, though the month symbol can not be determined with positive certainty by inspection of the photograph or of Maudslay's drawing. The corresponding date in the Sun Tablet is 13 Ahau 18 Kankin; and what is worthy of notice is that counting forward 537 days from 9 Akbal 6 Xul, year 8 Ezanab, brings us to 13 Ahau 18 Kankin, year 9 Akbal; this is probably the correct date. Using the katuns or cycles we can make connection with none of the given dates; hence the glyph on which the priest is standing may be omitted from the numeral series. Neither 9 Akbal 6 Xul, nor 13 Ahau 18 Kankin, nor 13 Ahau 18 Kayab will connect with any of the dates on the left slab by any of the numbers given.

Taking for granted that 9 Akbal 6 Xul is the date intended by the

aboriginal artist to be given at this point, we next try the connections forward.

The other dates and series in the middle space after 13 Ahau 18 Kankin ? (or Kayab ?), already mentioned, are the following: A date at O1, O2 over the hands of the right priest. This is too badly defaced to be determined; all that can be positively asserted is that the number of the day of the month is 3, thus rendering it certain that it must be Ahau, Chicchan, Oc or Men. The number of the day was small, seemingly 3 or 4, but evidently not exceeding 8; Maudslay's drawing gives 8. The corresponding date on the Tablet of the Sun as given by Goodman is 8 Oc 3 Kayab, and the same date is found correspondingly on the Tablet of the Foliated Cross. The next numeral series (2, middle space) is found in the second and third glyphs of column R, immediately behind the shoulders of the right priest. This appears by inspection to be 6 days, 11 chuens, 6 ahaus = 2,386 days. Maudslay, in his drawing of this inscription in part 10 of his work, makes the number of chuens 13, taking for granted, as seems to be indicated, though it is somewhat doubtful, that the two outer dots have been broken away. This would increase the total number of days to 2,426, while the true number appears to be 2,386.

Before attempting to make connections between the dates on the middle space and those which follow we will pass to the columns of the inscription on the right slab. The first date is found in glyphs T2, S3, viz: 11 —? 20 Pop. The day can not be determined by inspection. However, it must be Caban, Ik, Manik, or Eb, these being the only days which fall on the 20th day of the month. The number prefixed to the month in this instance is the full-count or 20 symbol, two semicircles. Before reaching a numeral series another date occurs at glyphs S4, T4, as follows: 5 —? 14 Kayab? The day can not be determined with certainty, but is apparently Cimi, or Cib, most likely the former; the month symbol is somewhat indistinct, but appears to be that of Kayab. The corresponding date in the inscription of the Tablet of the Sun and also of the Tablet of the Foliated Cross is 2 Cib 14 Mol, but in the former it is preceded by 4 Ahau 8 Cumhu, whose position is occupied in the Tablet of the Cross now under consideration by the 5 —? 14 Kayab? above mentioned. There is no recognizable numeral series in the middle space of either the Tablet of the Sun or Tablet of the Foliated Cross, but it is a singular fact that the second numeral series of the middle space of the Tablet of the Cross, given in the above list as 2,386 days, is exactly the lapse of time (counting forward) from 8 Oc 3 Kayab to 2 Caban 14 Mol in the Tablet of the Sun and Tablet of the Foliated Cross, and the 537 days of the first series in this space also connects the first and second dates in the middle space of the Sun Tablet, viz: 9 Akbal 6 Xul and 13 Ahau 18 Kankin. It is possible that these three inscriptions are dependent to some extent one upon the other, or are based upon an older and lost original.

Neither of the two dates preceding the first series of the right slab, as determined by inspection of the inscription, makes a satisfactory connection with any preceding or following date; the proper day, but not the proper number, and even the day of the month, is reached, but there is no complete agreement, nor can the result be followed up with proof of its correctness. If we deduct 8 days from 8,034, the first numeral series of the right slab, and count back from 5 Cimi 14 Kayab 10 Ben, we reach 13 Ahau 18 Kayab 1 Akbal, which may possibly be the correct date following the first series in the middle space. But this will not connect with 9 Akbal 6 Xul by the intermediate 537 days, but with 9 Akbal 6 Chen, year 13 Ezanab. However, if we deduct 8 days from 8,034, leaving 8,026, and count forward from 13 Ahau 18 Kankin, year 9 Akbal, the second date of the middle space, as found by calculation from 9 Akbal 6 Xul 8 Ezanab, this will bring us to 5 Cimi 14 Kankin, year 5 Ben, which may be the second date of the right slab, though the month symbol appears to be that of Kayab, and is so interpreted in Maudslay's drawing. This will change the days of the glyph T4 from 14 to 6, but these are exactly in the line of the break in the slab and have been restored by Dr Rau. Nevertheless, as 5 Cimi 14 Kankin will not connect with any following date by the numeral series as they stand, the result is not satisfactory.

The first date, 11 —? 20 Pop, if construed to be 11 Manik 20 Pop 5 Lamat, will, by counting forward with 15,217, the seventh series, bring us to 5 Kan 12 Kankin, year 7 Ben, the date of the sixth series, except that the month is Kankin instead of Kayab as in the inscription. Can it be that these supposed Kayab symbols should be interpreted Kankin? That some of them differ materially from the others is apparent. If, however, the date is construed to be 11 Ik 20 Pop, year 5 Akbal, and series 2 and 3 (4,749 and 123) be subtracted from the first series (8034), the remainder, 3,162, will, by counting forward, reach 1 Kan 2 Kankin, year 13 Akbal, the date following the first series except as to the month, which in the inscription appears to be Kayab, though uncertain. The day symbol of the first date, 11 —? 20 Pop, does not appear to be Ik, though too nearly obliterated to be determined by inspection. But it appears, on the other hand, as has been stated, that if we assume this first date to be 11 Manik 20 Pop, year 5 Lamat and count forward 15,217 (the seventh series), we reach 5 Kan 12 Kankin, year 7 Ben, date of the sixth series except the month, which is Kayab in the inscription, or what has usually been taken as Kayab, and is of the form given in the Dresden codex to this month symbol. And lastly, it may be stated that Maudslay's drawing is evidently intended to indicate Caban. As neither of these results can be followed up with other satisfactory connections they must be considered as merely accidental coincidences. The same remark applies also to the next date, 5 Cimi (or Cib?) 14 Kayab. Nor can any satisfactory connection be made with the next date—1 Kan 2 Kayab. By

reading it 1 Kan 2 Kankin, connection can be made in the manner mentioned above. If the date of the fifth series, left slab, be construed to be 9 Ik 20 Mol, which it may as well be as 5 Mol, by counting forward 4,542 days we reach 1 Kan 2 Kayab 5 Akbal, the apparently correct date, according to the inscription. If this reckoning be accepted it will form a connection between the inscriptions of the right and left slabs.

The second date following the first numeral series on this slab is found in glyphs S10, T10. This is 11 Lamat 6 Xul, year 10 Akbal; following this, at S12, T12, is the numeral series 9 days, 3 chuens, 13 ahaus, which equal 4,749 days, and following this series, at S14, T14, is the date 2 Caban 10 Xul, year 10 Lamat. The two last-mentioned dates make connection, as by counting forward 4,749 days from 11 Lamat 6 Xul 10 Akbal we reach 2 Caban 10 Xul in the year 10 Lamat. Immediately following the last-mentioned date, at S15, is the short numeral series (3, right slab), 3 days, 6 chuens, or 123 days, which, counting forward, bring us to 8 Ahau 13 Ceh, year 10 Lamat, the date which follows at T17, U1. The rule therefore holds good as to these dates and the two intervening numeral series. It would seem to follow, therefore, that the arrangement or plan of the series on this slab, when found, should coincide with the determination as to these two series; but from this point to the end of the inscription there is no connection of dates—with possibly one exception—without some change in dates or numbers from what they appear to be by inspection, or change in the direction of the reckoning. I shall therefore note the position of the dates and series which have been mentioned in the preceding list, and then add some remarks in regard to the relation of the dates and series to one another. I do this because Mr Goodman has left unnoticed the series of the inscription on this right slab, possibly because of the difficulty and seeming impossibility of bringing them into harmony with his theory.

Immediately following the last date mentioned there is at U2 a symbol denoting 9 cycles, or ninth cycle, but judging by the rule adopted by Mr. Goodman this is not to be considered a part of the numeral series (4) which follows immediately after at U3 to U4, viz, 18 days, 1 chuen, 8 ahaus, 1 katun=10,118 days. At U7, V7 is the date 3 Ezanab 11 Xul, the day somewhat indistinct, but so rendered, apparently correctly, by Maudslay. Following this at U8, U9 is the numeral series (5), 18? (or 17?) days, 10? (or 8?) chuens, 16 ahaus, 1? katun. The numbers of this series in the inscription have been injured to such an extent as to render uncertain those marked as doubtful; the number of days is assumed to be 13,138, which is probably correct, but the error, if there be one, is such that it should be readily discovered by means of connecting series, if these be correct.

Following the last series, at U10, V10 is a date so nearly obliterated

that it can not be determined (except the numerals) with positive certainty; it appears to be 5 Ahau 3 Tzec. Glyphs V12, U13 give another date, 5 —? 20 Zotz. The features of the day symbol are completely obliterated; the prefix to the month glyph is the symbol for 20. Immediately following, at V13 V14, is the series (6) 16 days, 6 chuens, 19 ahaus, 1 katun (14,176 days); at U17, V17 the date 5 Kan 12 Kayab; at W1, W2 the series (7) 17 days, 4 chuens, 2 ahaus, 2 katuns (15,217 days); at X5, W6 the date 1 Imix 4 Ceh (or Zip), month symbol somewhat doubtful, but one of the two named, apparently Ceh. Following this at X6, W7 is the brief series (8) 1 day, 1 chuen, 1 ahau (381 days), followed at X10, W11 by the date 7 Kan 17 Mol; this is followed at X11, X12 by the series (9) 7 days, 4 chuens, 8 ahaus, 2 katuns (17,367 days); following this at W14, X14 is an uncertain date—11 Cib, Cimi, or Chicchan, 14? (or 13?) Kayab? The day symbol and its number are distinct and clear, but the symbol is unusual; the number prefixed to the month symbol has been partially broken away; there were certainly two lines (10) and some two, three, or four balls. The month symbol is uncertain, but is apparently the same as that of the date 13 Ahau 18 Kayab? or Xul, in column L, though it has something additional on top. It is possible the symbol is intended for Chen or Kankin.

Following the last date (11 Cib?) at W15, X15 is the series (10) 2 days, 8 chuens, 16, 17, 18, or 19 ahaus. The three lines (15) prefixed to the ahau symbol are distinct, but the additional balls or dots have been injured to such an extent as to render the number uncertain (7,002 days, counting 19 ahaus). There is no date or other series in the remaining portion of the inscription.

If it be possible to determine the plan, succession, or arrangement of the series in this inscription, an important step will have been gained and a basis laid for the correct determination of the associated glyphs. The peculiarities of Mayan time system and notation so often lead to deceptive results that extreme caution is required, and a single connection or proper result is seldom sufficient evidence of a correct interpretation.

Taking the list of the series as given we are at once impressed with the strong general resemblance to the plan of the series on many of the plates of the Dresden codex, where several different series are found, some reckoned in one direction and some in another, as, for example, plate 73, where there are one entire series, parts of two others, and dislocated parts of two; or plate 70, where there are, in whole or in part, some half dozen series still in a tangle which has not yet been straightened out; also other plates.

Taking merely the numerical series in the order they stand and changed to days, there is certainly in the irregularly ascending scale an indication of arrangement, of and relation between the series.

These, beginning with the first in the middle space and following with the right slab and then with the left, are as follows:

Middle space

1......	537
2......	2, 386?

Right slab

1......	8, 034
2......	4, 749
3......	123
4......	10, 118
5......	13, 138
6......	14, 176
7......	15, 217
8......	381
9......	17, 367
10......	7, 002?

Left slab

1......	2, 980
2......	542
3......	274, 920
4......	297, 942
5......	479, 042
6......	9, 513

It is apparent from this list that there is an irregularly ascending scale following the order given, but so far no common divisor forming a basis of the differences has been found; moreover, the introduction at some three or four points of short periods seems to break in upon the idea of special references to the differences, as is usual in the Dresden codex. Besides this, the differences do not serve to connect dates, except possibly in two instances, while in one-third or more cases successfully traced individual numeral series do.

As the exceptions alluded to above may possibly prove to be important factors in determining the relations of the series on this tablet, it will not be amiss to again notice them here.

As is shown above, if we add two days to the first numeral series on the left slab, making it 2,982, and count forward from 8 Ahau 18 Tzec (2 Akbal), we shall reach 13 Ik 20 Mol (10 Akbal), the date following the second numeral series. If now we add the first numeral series as corrected—2,982—to the third numeral series (after deducting calendar rounds)—9,200—making a total of 12,182, and count forward this number of days from 8 Ahau 18 Tzec (2 Akbal), we reach 9 Ik 15 Ceh (9 Lamat), the date following the third numeral series. If we go back now and subtract the second numeral series—542—from the first—2,982—which leaves 2,440 days, and count forward this number of days from 8 Ahau 18 Tzec (2 Akbal), we reach 4 Ahau 8 Cumhu

(8 Ben), the date following the second numeral series. These agreements can scarcely be accidental, and if not, they establish two facts: First, that Goodman's interpretation of the face glyphs giving the date 8 Ahau 18 Tzec is correct, or at least brings a correct result; and, second, that the emendation of the first numeral series by adding 2 days is also correct. Other relations of dates on the left slab have been given, besides which no further connection by using the differences of the numeral series can be obtained.

Turning to the right slab, if, as has been suggested, we assume the first date (11 — ? 20 Pop) to be 11 Ik 20 Pop (year 5 Akbal), and subtract series 2 and 3 (4,749 and 123) from the first series (8,034), the remainder, 3,162, counting forward from 11 Ik 20 Pop (5 Akbal) will bring us to 1 Kan 2 Kankin 13 Akbal, the date following the first numeral series, if the month symbol is interpreted Kankin instead of Kayab. This result, however, is not so satisfactory as that of the left slab, as the day in (11 — ? 20 Pop) does not appear to be Ik, though indeterminable by inspection; but it has been referred to in connection with the reckoning in regard to the inscription onthe left slab, as it may tend to show that these minor series are to be deducted in tracing connection of the dates.

After a somewhat lengthy and careful study of the inscription on this tablet, testing the relation of the series by calculation in every possible way, I have failed to find any satisfactory evidence of connection in a continuous line. The indications point rather to two or more parallel lines. There are, however, difficulties in the way of obtaining a clear understanding of the plan adopted by the original artist which I have been unable to overcome, so great, in fact, that were it not for other evidence, the correctness of Goodman's theory in this respect would be left in doubt. It was probably on account of these difficulties that this author omitted any reference to the inscription on the right slab, the best known and most accessible to students of all the Central American inscriptions. Some indications of different lines of series are found in the overlapping of reckonings in the inscription of the left slab already given.

At glyph U2 of the right slab, immediately after the date 8 Ahau 13 Ceh which follows numeral series 3 of this slab (see list of series above), is the symbol for 9 cycles, which, as we have stated, is not connected with any numeral series. This is, as will be found in other instances, probably intended to indicate that at this point 9 cycles have been completed from 4 Ahau 8 Cumhu, the date following series 1 of the left slab. The day 8 Ahau 13 Ceh is the first day of the 10th cycle as given in Goodman's chronological calendar. It is, however, certain that all the numeral series preceding it on the tablet fall short of amounting to 9 cycles. Moreover, some of them appear, as has been shown, to reach back over others, thus lessening the number to be

actually counted. These facts seem to indicate that there is some omission, in truth a very large one; but with our present knowledge we are unable to solve the problem.

I have already alluded to the question of connection between the left and right slabs, direct, or by means of the characters in the middle space. Mr Goodman evidently follows the idea that the beginning of the inscription on the right slab (six columns) follows directly the close of that on the left slab. He does not make this plain in his notes on this tablet (op. pp. 135, 136), but when his remarks and figure on a previous page are considered (p. 96) it becomes evident, as the two upper glyphs of this figure are the last (E17 and F17) of the inscription on the left slab, and the other three the first three (S1, T1, and S2) in the inscription on the right slab. In connection therewith he remarks as follows:

> The reckoning here is from the beginning of a great cycle. A notation of 1–6–7×12 (the 12 erroneously appears as 13) precedes the glyphs and is to be incorporated with them. The reckoning shows the difference between the dates in the annual calendar.

His reckoning (1–6–7×12) is 1 katun, 6 ahaus, 7 chuens, 12 days= 9,512 (given in the sixth series of our list of the left slab as 9,513). If it were true, as he states, that the "reckoning shows the difference between the dates of the annual calendar," meaning the date preceding and that following the numeral series, this would be strong proof of connection, but unfortunately Mr Goodman is mistaken in this instance, as neither the last preceding date (9 Ik 5 Mol), nor the initial date, nor any other date of the left slab connects by 9,512 or 9,513 with either of the first two dates of the right slab, or any other date thereon. If there be any connection between the dates in the different spaces, it is between those of the middle space and those of the right slab, reading forward, and the last date on the inscription of the right slab and one of those on the left.

It is evident from what has been shown that the proof of Mr Goodman's theory, drawn from the Tablet of the Cross, is not very satisfactory, as not more than one-third of the dates thereon can be connected thereby. But where two and three series connect in succession the probability of the double or treble coincidence is so extremely remote that the theory as to the numeral symbols and their use may be accepted as demonstrated. If the double connection occurred but once in the whole range of the inscriptions it would be best to conclude this to be a mere coincidence, but as this occurs again and again in the inscriptions, and even, as will be seen, a succession of three and four, the proof is too strong to be resisted. Even without this mathematical demonstration the strong, in fact, evident resemblance of these numerical series to those of the codices is almost, if not quite, sufficient to justify Goodman's interpretation of the numeral symbols to which allusion has been made.

A B C D E F G H I K L M N

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

TEMPLE OF THE SUN. THE INSCRIBED PAN

PHOTOGRAPHED FR

N O P Q R

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

...AN ON THE BACK WALL OF THE SANCTUARY.
...FR A PLASTER CAST.

TABLET OF THE SUN

We turn to the inscription on the Tablet of the Sun—of which we also have a photograph by Mr Maudslay, shown in our plate XLI—and to Mr Goodman's comment, which is as follows (page 136):

Initial date: 54–1–18–5–3×6–13 Cimi 19 Ceh. The month symbol comes after one of the glyphs of the initial directive series. A reckoning of 1–2×11, with three unintelligible glyphs following, points to a date which appears to be 1 Caban 10 Tzec; but as that is not the date to which the intelligible part of the reckoning would lead, both the date and direction are uncertain. Thirteen glyphs follow, some of them of recognizable purport, but the exact meaning of which in this connection I do not know. Then comes a restatement of the initial reckoning, 1–18–5–3×6, from the beginning of the great cycle, followed by nine glyphs whose use here is unintelligible, though four of them are signs with whose meaning we are acquainted. Next in order comes a reckoning of 9–12–18–5×16 (followed by four glyphs nearly identical with a series in the preceding inscription), from 4 Ahau 8 Cumhu, the beginning of the great cycle, to 2 Cib 14 Mol. This is correct. After five incomprehensible glyphs occurs the date 3 Caban 15 Mol. In the annual calendar the last two dates adjoin each other, but whether the latter is here intended to be the succeeding day, or whether some calendar rounds are indicated by the characters preceding it, is something we are at present unable to determine. Sixteen baffling glyphs follow, and then there is a reckoning of 7–6–12×3–12 Ahau 8 Ceh. There are no recognizable directive signs here, but by trial we discover that the reckoning is the distance between 12 Ahau 8 Ceh and 9 Akbal 6 Xul, a date that comes after six intervening glyphs. Eight more unintelligible glyphs occur, and then a reckoning of 6–2×18 (the 18 should be 17), 2 Cimi 19 Zotz. The directive signs are unfamiliar, but as the reckoning is backward to 9 Akbal 6 Xul, they probably denote that fact. Next is 1–8×17, 13 Ahau 18 Kankin, which is declared to be a 10th ahau, the reckoning being the distance from 9 Akbal 6 Xul to that date. Both of these dates are subsequently repeated for some reason, and the record ends with 8 Oc 3 Kayab, followed by ten glyphs whose meaning is not apparent.

This is a puzzling inscription so far as its numeral or time series are concerned, a fact apparent from the comment which Mr Goodman makes on it. Although there are several series with sufficient data for the purpose of tracing them, but few of the dates can be connected, and these not satisfactorily.

The series and dates in the order in which they come in the inscription are as follows, adopting Goodman's interpretation of the initial series:

Left slab

								Days
1	54	1	18	5	3	6	13 Cimi 19 Ceh (9 Lamat)	
2				1	2	11	1 Caban? 10 Tzec (3 Lamat)	411
3		1	18	5	3	6	(No date) (275,466)	9, 746
4		9	12	18	5	16	(No date) (1,388,996)	3, 456

Middle space

		9 Akbal 6 Xul (8 Ezanab)
1	(Unintelligible)	13 Ahau 18 Kankin (9 Akbal)
		8 Oc? 3 Kayab? (11 Lamat?)

Right slab

						4 Ahau 8 Cumhu (8 Ben)	
						2 Cib 14 Mol (5 Akbal)	
						3 Caban 15 Mol (5 Akbal)	
1	7	6	12	3		12 Ahau 8 Ceh? (6 Ben?) (52,803)........	14,843
						9 Akbal 6 Xul (8 Ezanab)	
2		6	2	18		2 Cimi 19 Zotz (2 Lamat)..................	2,218
3		1	8	12		13 Ahau 18 Kankin (9 Akbal)............	532

For convenience of reference the series of each division are numbered at the left; the year to which the date refers is given in parenthesis following the date, and the equivalent in days of the time series—after deducting the calendar rounds where greater than one round—is placed at the right. The positions of the various dates and series in the inscription are given as we proceed.

In this inscription, as that of the Cross, the numbers prefixed to the periods of the initial series are face characters instead of the ordinary number symbols, except the number prefixed to the month symbol Ceh, which consists of the usual lines and dots. This initial series—54–1–18–5–3–6—interpreted, is as follows: The fifty-fourth great cycle, 1 cycle, 18 katuns, 5 ahaus, 3 chuens, 6 days, to 13 Cimi the 19th day of the month Ceh. Mr Goodman's interpretation of this inscription, so far as it extends, is given above. It appears that he places, as seems to be his rule, the inscription in the middle space after that in the right slab. It is possible, as is indicated by what follows, that he is right in this instance.

That 13 Cimi 19 Ceh, the first date, will not connect with the next date by 1 ahau, 2 chuens, 11 days (411 days), the second numeral series (in reverse order)—glyphs A13, B13—is certain, as the reckoning brings us by counting forward to 8 Caban 5 Muan, year 10 Ben. Yet, notwithstanding the radical error on the part of the original artist implied by the assumption that the last is the correct date here, there are some grounds for the assumption. As there are no more dates on the left slab, Goodman assumes that those attached to the 3d numeral series, which is precisely the same as the initial series, are the same as those which precede and follow that series, viz, 4 Ahau 8 Cumhu, beginning of the 54th great cycle, and 13 Cimi 19 Ceh. But this result, it must be remembered, is based upon the assumption that Mr Goodman's interpretation "13" Cimi of the first given date is a correct rendering of the face numeral. In this case his determination has been reached not from the details of the face character, but from his theory that his 54th great cycle begins with 4 Ahau 8 Cumhu, as counting forward 1–18–5–3–6 (9,746 days after deducting the calendar rounds) reaches 13 Cimi 19 Ceh (9 Lamat). This is apparent from his statement on page 49 of his work, where he gives figures of face signs for 13:

I do not know what to conclude about the last face in the list, which is the day numeral in the initial date of the Temple of the Sun, Palenque. It is more like the

chuen sign than any other, but the numeral is unmistakably 13. It is more reasonable to suppose that the sculptor made a mistake in the *kin* sign, than that the chuen symbol should have been used to represent both 13 and 15.

The third number series is found (in reverse order) in glyphs C7, D7, C8, D8, the ahau and cycle symbols—D7 and D8—being face characters.

The fourth series, 9–12–18–5–16, or 9 cycles, 12 katuns, 18 ahaus, 5 chuens, 16 days, is found (in reverse order) in glyphs C14 to C16, inclusive. Here the days are not joined to the chuen symbol as usual, but have a separate symbol (C14), a face character with the number prefixed. The chuen symbol (D14) is also a face character. The series reduced to days is 1,388,996, from which subtracting 73 calendar rounds leaves 3,456 days to be counted. Counting forward this number of days from 4 Ahau 8 Cumhu (8 Ben) the beginning of Goodman's fifty-fourth great cycle, we reach 2 Cib 14 Mol (5 Akbal). Both dates in this instance are found *after* the numeral series and on the right slab—4 Ahau (P2) 8 Cumhu (O3); 2 Cib (O4) 14 Mol (P4.). Placing the dates together before or after a numeral series which denotes the lapse of time between them is unusual, but not without precedent.

Using the last result, we may perhaps find the proper connection with 13 Cimi 19 Ceh, the first given date. Subtracting the third series (275,466 days) from the fourth series (1,388,996 days) leaves 1,113,530 days, from which subtracting 58 calendar rounds (1,100,840 days) leaves 12,690 days to be counted. Reckoning back this number of days (12,690) from 2 Cib 14 Mol (5 Akbal) we reach 13 Cimi 19 Ceh (9 Lamat) the first date of the left slab. Of course it follows that counting forward from 13 Cimi 19 Ceh (9 Lamat), the difference between the third and fourth series, we reach 2 Cib 14 Mol (5 Akbal). Subtracting the third series from the fourth in order to get back to 13 Cimi 19 Ceh is certainly proper, as the former is included in the latter. These results would seem to be correct, and if so, justify Goodman's interpretation "13" of the face numeral joined to Cimi, and form a second connection between the inscriptions of the left and right slabs. However, using the last number, 12,690 less 411 (12,279), and counting back from 2 Cib 14 Mol, we reach 8 Caban 5 Muan (10 Ben) instead of 1 Caban 10 Tzec. As this is, as it should be, also the date reached by counting forward 411 days from 13 Cimi 19 Ceh (9 Lamat), I am inclined to believe that it is correct, and that here the original artist has by mistake given an erroneous date. It is apparent that to use 411 days in counting forward from 13 Cimi 19 Ceh, year 9 Lamat, must of necessity bring us into the year 10 Ben, therefore, as 1 Caban 10 Tzec can not be connected with any other date by subtraction, addition, or skipping, and the date 8 Caban 5 Muan will connect both backward and forward, it may be accepted as probably correct.

As there is no numeral series in the middle space, these may be left

to be determined by the dates, or from the numeral series in the corresponding position in the Tablet of the Cross. Be this as it may, it is certain that the first numeral series in the middle space of the latter tablet—537 days—measures exactly the lapse of time from 9 Akbal 6 Xul to 13 Ahau 18 Kankin of the Sun Tablet; and that 2,386 days, the second series in the middle space of the Tablet of the Cross, is exactly the time from 8 Oc 3 Kayab (middle space) to 2 Cib 14 Mol, second date on the right slab of the Tablet of the Sun. This result, however, would seem to be contrary to the evidence adduced of the direct connection between the inscriptions of the left and right slabs; nevertheless it is a remarkable coincidence which depends on some fact in regard to the series not yet ascertained. Possibly these form a separate succession of series.

I have been unable to find any connection between either of the dates of the right slab which precede the first numeral series and any one which follows. This series in reverse order is 3 days, 12 chuens (glyph P16), 6 ahaus (Q1), and 7 katuns (R1), equal 52,803 days, or, after subtracting 2 calendar rounds, 14,843 days. Using the latter and counting forward from 12 Ahau (Q2) 8 Ceh (R2), year 6 Ben, we reach 9 Akbal (Q6) 6 Xul (R6), year 8 Ezanab. Here also both dates follow the numeral series.

Following the last-mentioned date, at Q11, R11 is the numeral series 18 days, 2 chuens, 6 ahaus, or 2,218 days. This is followed at Q12 R12 by the date 2 Cimi 19 Zotz (year 2 Lamat), which is followed at Q14, R14 by the numeral series 12 days, 8 chuens, 1 ahau (left portion of R14), and this is followed at R14 (right portion) and Q15 by the date 13 Ahau 18 Kankin. It will be observed that two of these dates are the same as the first and second dates of the middle space. It seems from the reckonings which follow that the number of days in the second numeral series should be 2,217 instead of 2,218. Subtracting 2,217 from the first series (14,843), the remainder—12,626 days—exactly measures the lapse of time from 12 Ahau 8 Ceh, year 6 Ben, of the first series, to 2 Cimi 19 Zotz, year 2 Lamat, of the second series. Counting forward 2,217 days from 2 Cimi 19 Zotz we reach 9 Akbal 6 Xul, year 8 Ezanab; this may be the first date in the middle space, and not the 9 Akbal 6 Xul which precedes the second series of the right slab, as Goodman contends, which would be a backward count as stated in the quotation on page 761; or it may be an omitted date. Counting 537 days (532 in third series right slab should evidently be 537, the number given between the same dates in the middle space of the Tablet of the Cross) from 9 Akbal 6 Xul, we reach 13 Ahau 18 Kankin, third series and last date on the right slab; or, adding together the second and third series—the 2,217 and 537, making 2,754 days—and counting forward from 2 Cimi 19 Zotz, year 2 Lamat, we also reach 13 Ahau 18 Kankin. These results seem to justify the slight corrections made in the numerals.

TEMPLE OF THE FOLIATED CROSS. INSCRIBED

PHOTOGRAPHED F

NEL ON THE BACK WALL OF THE SANCTUARY.

A PLASTER CAST.

The data also seem to favor Goodman's conclusions except in one or two cases where his statements are palpably erroneous. He gives 17 as the number of days in the third series right slab without reference to the fact that the inscription shows 12. I think that 17 days are to be counted here, but the inscription shows clearly 12.

TABLET OF THE FOLIATED CROSS

The next inscription to which attention is directed is that on the so-called Tablet of the Foliated Cross. Here we are favored with Mr Maudslay's excellent photograph, of which a copy is given in our plate XLII.

The numeral series and dates in the order in which they stand in the inscription, including the initial series as interpreted by Goodman (except as to the 20 days), are as follows:

Left slab

								Days.
1	54	1	18	5	4	0	1 Ahau 13 Mac (9 Lamat) (275,480)	9,760
2					14	19	1 Cauac 7 Yax (10 Ben)	299
3			1	14	14	0	2 Ahau 3 Uayeb (4 Ezanab)	12,520
							1 Ahau 13 Mac (9 Lamat)	
4		7	7	7	3	16	(no date) (1,060,996)	17,09[illegible]

Middle space

8 Oc 3 Kayab (11 Lamat)

Right slab

							2 Cib 14 Mol (5 Akbal)	
							3 Caban? 15 Mol (5 Akbal)	
1?				6	9	3	(no date; doubtful series though distinct)	2,343
2			2	9	6	4	8 Ahau 3 Uo? (12 Ezanab?) or 8 Oc 3 Kayab...	17,764
3				6	11	6	(no date)	2,386
4				1	12	4	8 Ahau 8 Uo? (7 Ben?)	604
5?			13	0	0	0	(no date; probably not a counter)	(17,680?)

As in the lists heretofore given, for convenience the series are numbered at the left, the years are added in parentheses, the number of days are indicated by the numeral series placed to the right, and the remainder is shown after the calendar rounds have been subtracted when the total exceeds a calendar round. In place of the 20 days given by Goodman I have in each case substituted 0 days, as I thus interpret the symbol in the inscription.

As the reader must have the inscription before him to find the position of the numeral series and dates and is presumed now to be sufficiently posted to find them from the list given above, it is deemed unnecessary to give here a list of the glyphs. Such reference to special glyphs as is deemed necessary will be made as we proceed.

The numerals to the time periods in the initial series of this inscription, as in the two which have been examined, consist of face characters,

except the 13 to the month Mac. For their determination we are indebted chiefly to Mr Goodman, the evidence so far as obtained being sufficient to enable us to identify some of them. The date from which this series is counted, the beginning of Mr Goodman's so-called fifty-fourth great cycle, is, of course, 4 Ahau 8 Cumhu, in the year 8 Ben. Counting forward from this date 9,760 days, the number after the calendar rounds are subtracted, brings us to 1 Ahau 13 Mac (9 Lamat), the first recorded date. As it is with the latter date, which is designated the "initial date," though it is not strictly so, that Mr Goodman begins his reckoning, we give here his comment on the inscription:

Initial date: 54–1–18–5–4×20–1 Ahau 13 Mac. This date is just fourteen days later than the initial date of the preceding inscription [Tablet of the Sun]. The directive series follows, succeeded by a reckoning of 14 chuens and 19 days to 1 Cauac 7 Yax. Eleven unreadable glyphs come next, and then 1–14–14×20, which, after four uncertain directive characters, is declared to be a reckoning to the beginning day score of the second cycle, 2 Ahau 3 Uayeb. It is correct. Then come two reckonings in an unfamiliar style, the first from the beginning of the great cycle, the second from 1 Ahau 13 Mac. I am positive of this, for the very next reckoning will show that there are 40,000 days to be accounted for somehow, and they can be represented only by one of these counts. That reckoning is: 7–7–7–3×16, to 2 Cib 14 Mol. Subsequent computations show that date to be the one to which 9–12–18–5×16 led up in the preceding inscription; hence the necessity for something to explain the missing 40,000 days. As from this on the reckoning and dates of the two inscriptions are nearly the same, it is not worth while to repeat them; I will, however, give a synopsis showing the position of the dates in both:

(1)	54	1	18	5	3× 6	13 Cimi 19 Ceh
(2)	54	1	18	5	4×20	1 Ahau 13 Mac
(3)	54	1	18	6	18×19	1 Cauac 7 Yax
(4)	54	2	20	20	18×20	2 Ahau 3 Uayeb
(5)	54	9	3	1	15×20	12 Ahau 8 Ceh
(6)	54	9	10	2	6× 6	2 Cimil 19 Zotz
(7)	54	9	10	8	9× 3	9 Akbal 6 Xul
(8)	54	9	10	10	18×20	13 Ahau 18 Kankin
(9)	54	9	12	11	12×10	8 Oc 3 Kayab
(10)	54	9	12	18	5×16	2 Cib 14 Mol
(11)	54	9	13	20	18×20	8 Ahau 8 Uo

Beginning with the first date, 1 Ahau 13 Mac (which falls in the year 9 Lamat), in regard to which we follow Mr Goodman's determination, the prefixed number and the day also being face glyphs, we count forward 19 days and 14 chuens, or 299 days. This reckoning reaches 1 Cauac 7 Yax in the year 10 Ben. This is correct, as this date is found at B13, A14 immediately following. This result is important, as it furnishes strong evidence of the correctness of the number assigned by Mr Goodman to the face glyph attached to the day Ahau. The reckoning here is forward, which is presumed to be the direction followed by the other series.

As the next numeral series (C3 to D4, reverse of usual order) is, as I

count it, 1 katun, 14 ahaus, 14 chuens, 0 days, or, in all, 12,520 days, the reckoning is forward this number of days, presumably from 1 Cauac 7 Yax in the year 10 Ben. No connection is made by this count; but when 299 days, the amount of the previous series are deducted, the remainder—12,221 days—will carry us to 2 Ahau 3 Uayeb (or the third added day) of the year 4 Ezanab. This is correct, as we find this date following the series at C8, D8. By using the whole numeral series—12,520 days—and counting from the first date—1 Ahau 13 Mac (9 Lamat)—we reach the latter date—2 Ahau 3 Uayeb—as, of course, we should. We thus have proof not only that Mr Goodman has correctly interpreted the symbol at D8 as that of the Uayeb, or 5 added-day period, but also additional evidence in favor of the number assigned by him to the face character of the first date. It may be said that this first date was found by counting backward from after dates. Be it so, this method is perfectly legitimate and is the only means of determination in such case unless his theory of counting from the beginning of the great cycle and also his interpretation of the face numerals be accepted. The symbols of the month and day of the month are clear, and limit the day to one of four—Ahau, Chicchan, Oc, Men—none of which, save Ahau, will connect with the following dates. I therefore deem the evidence sufficient for acceptance.

As 1 Ahau 13 Mac is reintroduced at D14, C15, it would seem that a new reckoning should begin from this point. The result of the trial, using the entire numeral series which comes immediately after the date is as follows:

	Days
7 cycles	1,008,000
7 katuns	50,400
7 ahaus	2,520
3 chuens	60
Days	16
Total	1,060,996
Deduct 55 calendar rounds	1,043,900
Remainder	17,096

As 1 Ahau 13 Mac falls in the year 9 Lamat, we reckon from that date, counting forward 17,096 days, and reach 2 Cib 14 Yax in the year 4 Akbal. This is correct except as to the month, which, as shown by glyph M1, is certainly Mol. It is evident, therefore, that Mr Goodman is wrong in assuming that the series 7–7–7–3–16 (or 17,096 days after casting out the calendar rounds) connects 1 Ahau 13 Mac of the left slab with 2 Cib 14 Mol, the first date of the right slab, unless the month is corrected to Yax. What he means by "40,000 days to be accounted for," and that they are to be accounted for by the reckoning "7–7–7–3–16 to 2 Cib 14 Mol," is not clear. According to his "synopsis showing the position of the dates in both [inscriptions]"

given above, the lapse of time, as can be seen by subtracting series 2 from series 10, is 52,520 days, thus:

Series 11..	9	12	18	5	16
Series 2...	1	18	5	4	0
	7	14	13	1	16
Fourth series left slab Foliated Cross	7	7	7	3	16
		7	5	16	0=52,520 days.

He makes the lapse of time from 1 Ahau 13 Mac to 2 Cib 14 Mol 7–14–13–1–16=1,113,516 days, or 12,676 after casting out the calendar rounds. That this number of days will connect the two dates is certainly true, but where is the evidence to justify this radical change of the numeral series by the addition of 52,520 days? Where is the proof that these two dates are to be connected by the fourth numeral series? A number can be found to connect any two dates, but there must be demonstration first that they are to be connected according to the plan of the aboriginal artist. The direct connection between the series of the left and right slabs is therefore not proved, though the reckonings given above seem to indicate it.

Passing over the middle space to the right slab, the first date (L1, M1), already noticed, is 2 Cib 14 Mol; the next, found at M5, L6, is 3 Caban 15 Mol, which is the next day in the calendar after 2 Cib 14 Mol, both being in the same year—5 Akbal. Following the latter at L16, M16 is what appears to be a numeral series (1), to wit, 6 ahaus, 9 chuens, 3 days. Whether this is to be recognized as a numeral series which is to be counted is uncertain, as it is immediately followed at M17, N1, O1, by the series (2) 4 days, 6 chuens, 9 ahaus, 2 katuns (17,764 days). The latter is followed at N5, O5 by a somewhat uncertain date, 8 Oc 3 Kayab, or 8 Ahau 13 Uo. The day is a face symbol and the month symbol is unusual, but more like that for Kayab than any other. It is included in Goodman's synopsis as 8 Oc 3 Kayab. This is followed at N6, O6 by the series (3) 6 days, 11 chuens, 6 ahaus (2,386 days), which, in turn, without any intermediate recognizable date, is followed at O13, N14 by the series (4) 4 days, 12 chuens, 1 ahau (604 days). This is followed at N15 by the date 8 Ahau 8 Uo. Immediately following, at O15, is the symbol for 13 katuns, which is followed by no date.

We find by trial that neither 2 Cib 14 Mol nor 3 Caban 15 Mol will connect by the first series, 6–9–3 (2,343 days), nor the second, 2–9–6–4 (17,764 days), with either of the dates which follow. The reckoning forward of 17,764 days from 2 Cib 14 Mol, year 5 Akbal, reaches 8 Ahau 13 Uo, year 2 Lamat, which might be accepted as correct, as the day symbol, which is a face character, is much like that for Ahau, but for three reasons: First, the month symbol is wholly different from that denoting Uo, though somewhat unusual, being apparently that for

Kayab; second, 8 Ahau 13 Uo will not connect with the following date; third, 8 Oc 3 Kayab will answer more requirements of the position than will 8 Ahau 13 Uo. Assuming 8 Ahau 13 Uo to be correct, the only connection is backward by the second numeral series, 17,764, with 2 Cib 14 Mol, first date of the right slab. Assuming the date to be 8 Oc 3 Kayab and counting forward 2,386 days, the third numeral series followed by no date, we reach 2 Cib 14 Mol, year 5 Akbal, which is presumed to fill the place of the missing date. Counting forward from this 604 days, the fourth numeral series, we reach 8 Ahau 8 Uo, year 7 Ben, the date which follows. I am inclined, though with considerable doubt, to accept this as the correct solution, as Goodman seems to have done, but it leaves us without any connection backward from 8 Oc 3 Kayab. Similar duplication of dates is found in the inscription of the Tablet of the Sun.

In this case, as well as in the preceding inscription, if we count 2,386 days (the number in the second series of the middle space in the Tablet of the Cross) from 8 Oc 3 Kayab in the middle space, we connect with 2 Cib 14 Mol, first date on the right slab.

Let us examine now Goodman's synopsis (page 766). By comparing it with the lists of the series of the Tablet of the Sun and the Tablet of the Foliated Cross (pages 761, 765), it will be seen that he begins with the first series on the left slab of the Tablet of the Sun (date 13 Cimi 19 Ceh). His next series is the first of the left slab of the Tablet of the Foliated Cross (date 1 Ahau 13 Mac) the lapse between the two being 14 days. His next (3) is the second series, left slab of the Tablet of the Foliated Cross (date 1 Cauac 7 Yax); his next (4) is the third, left slab of the Tablet of the Foliated Cross. This skips over the second series of the left slab of the Tablet of the Sun (date 2 Caban 10 Tzec). Moreover, the fourth series (4), which he gives here as 2–20–20–18–20 (the 20s and 18 each being in fact counted by him as 0, as can readily be shown by his own figures, 2–0–0–0–0 making the connection he designates), is made not by adding the third series of the left slab of the Tablet of the Foliated Cross (1–14–14–0) to his series 3, but to series 2, the second series of the tablet (14–19) being included, as I have shown, in the third (1–14–14–0). In other words, the count from 1 Cauac 7 Yax to 2 Ahau 3 Uayeb is to be obtained by subtracting series 2 (14–19) from the third series (1–14–14–0), left slab of the Tablet of the Foliated Cross. The next three dates, 12 Ahau 8 Ceh, 2 Cimi 19 Zotz, and 9 Akbal 6 Xul, appear to have been located by his theoretic scheme and not by the data obtained from the inscriptions. This may be shown as follows:

From 2 Ahau 3 Uayeb, third series of the left slab of the Tablet of the Foliated Cross, he skips to 12 Ahau 8 Ceh, first series on the right slab of the Tablet of the Sun, making a jump from the beginning of the second cycle (2–0–0–0–0) of his fifty-fourth great cycle to

9–3–1–15–0 (3 katuns, 1 ahau, and 15 chuens on the ninth cycle), and thence by the next step (6) to 9–10–2–6–6, 2 Cimi 19 Zotz, the date of the second series of the right slab of the Tablet of the Sun. This gives as the count forward from his date 4 to his date 5, 7–3–1–15–0, which, it is true, expresses the exact lapse of time between these two dates. But upon what evidence in the inscriptions is this succession founded? According to his own statement the lapse of time from 4 Ahau 8 Cumhu, beginning day of his fifty-fourth great cycle, to 2 Cib 14 Mol is 9–12–18–5–16, while in his synopsis the distance to 12 Ahau 8 Ceh is given as 9–3–1–15–0. It is apparent, therefore, that he places 12 Ahau 8 Ceh back, in the order of time, of 2 Cib 14 Mol, 9–16–8–16 or 70,676 days. As any given date will reappear in each calendar round or 52-year period, the position in the great cycle, even on his theory, should be determined by the series of the inscription. This is done in regard to 13 Cimi 19 Ceh, 1 Ahau 13 Mac, 1 Cauac 7 Yax, 2 Ahau 3 Uayeb, and also in regard to 2 Cib 14 Mol, but there is no evidence to show that it has been done in regard to 12 Ahau 8 Ceh, nor is any backward connection indicated by which the position of this date can be ascertained.

Starting with 12 Ahau 8 Ceh and the series (5) of his synopsis with which it is connected, as a basis, his count (6) to 2 Cimi 19 Zotz and thence (7) to 9 Akbal 6 Xul is in accordance with the numeral series, if we assume with him that the count from 2 Cimi 19 Zotz, second series, right slab of the Tablet of the Sun, though forward in the order of time, goes back in the arrangement of the inscription to the 9 Akbal 6 Xul which precedes it. But it is equally true that if, as he holds, the middle space follows the right slab, connection will be made with the 9 Akbal of the middle space. However, as the figures agree with the inscription, making the two minor changes in the numbers heretofore suggested, we pass to the following dates.

The connection of 9 Akbal 6 Xul with his date (8) 13 Ahau 18 Kankin is correct, the change heretofore suggested in the third numeral series, right slab, from 532 to 537, being made. But when we pass to his next series (9), date 8 Oc 3 Kayab, we find the interval 2–1–12–10 (15,010 days), which is evidently the date of the second series right slab of the Tablet of the Foliated Cross. This reckoning will, it is true, carry us back to 13 Ahau 18 Kankin, presumably the last date of the Tablet of the Sun, the same date appearing also in the middle space; but it is without any authority in the inscription. This is followed in his synopsis (10) by 2 Cib 14 Mol, which appears in the same relative position both on the Tablet of the Sun and the Tablet of the Foliated Cross, but refers here to the date to be supplied, as has been shown, to the third series on the right slab of the Tablet of the Foliated Cross. The interval he gives between the two dates is 6–11–6, which is in accordance with the inscription. This is followed (11) by 8 Ahau 8 Uo with an interval of 1–12–4, which is also correct.

It will be seen from this discussion that there are some breaks in his synopsis which will, until they are explained, leave it in an unsatisfactory condition. Nevertheless, as has been suggested, the two inscriptions appear to be based on the same general plan and intimately related; in fact, they present substantially the same chain of series.

TEMPLE OF INSCRIPTIONS

We turn next to the inscription found in the so-called Temple of Inscriptions, where we have the benefit of Mr Maudslay's photographs and drawings and, to some extent, of Mr Goodman's interpretation. As parts of the inscription have been badly defaced it is

FIG. 18—Part of the inscription on the wall of the Temple of Inscriptions, Palenque.

impossible to give the series and dates in connected form. Attention will therefore be directed only to such portions as are sufficiently distinct to be determined with probable correctness by inspection. As Mr Goodman has given, on page 114 of his work, a copy of part of the inscription with comments, reference will be made first to this portion, of which a copy is given in our figure 18. This portion is lettered and numbered separately in the usual manner.

Mr Goodman's comments, as given on pages 114 and 115 of his work, are as follows, the breaks and parentheses being his own:

The reading of the above, so far as I can make it out, is as follows: (To the) 10 Ahau . . . . . 13 Yaxkin . . . . . (that is) 1 calendar round . . . . . (from a, or the same) date appearing some distance back—8 days, 9 chuens (there is what

appears almost like a trick here: the number of chuens is not designated by three dots, but by three signs for 3) . . . . . (and) 12 ahaus . . . . . reckoning backwards, (by) katuns (probably a manner of denoting the reckoning to be a long one) . . . . . (to) 8 Ahau . . . . . 13 Pop . . . . . (1,040) bissextile periods (in addition. It is impossible, with our imperfect knowledge of the Maya numerals, to say just how this number of bissextile periods is expressed; but a subsequent reckoning shows that 80 calendar rounds, or 1,040 four-year periods, are implied here.) . . . . . reckoning backwards . . . . . (an unintelligible glyph; though, as is very like some we have just seen employed in scanning the katuns, it probably has the same significance as the katun sign previously made use of to indicate a long reckoning) . . . . . (to the) 5 Lamat . . . . . 1 Mol . . . . . (that is) 8 days, 4 chuens . . . . . (and) 2 ahaus . . . . . (from the) 3 Ahau, beginning a katun . . . . . 3 Zotz . . . . . a twentieth ahau (or beginning of a katun)—1 day, 12 chuens . . . . . 1 ahau . . . . . 9 katuns . . . . . (and) 2 cycles . . . . . (the count covering) 18 calendar rounds . . . . . (from, or to—for it is uncertain if the reckoning is intended to fix the position of the date 5 Lamat–1 Mol more circumstantially, or is a separate reckoning back from it) the tenth score (or fifth double score) of days, (in the) seventh cycle . . . . . (and) 7 days . . . . . (from the) twentieth (or beginning score) . . . . . 1 Manik . . . . . 10 Tzec (there is a mistake somewhere, as the date at that point is 9 Manik–20 Zotz) . . . . . the beginning of a seventh day (or 7-day period). Reckoning backwards, (by) katuns . . . . . (an unintelligible glyph, though it probably indicates a period of some kind) . . . . . 8 days, 5 chuens . . . . . 10 ahaus . . . . . 11 katuns . . . . . (and) 10 cycles . . . . . (to) a date appearing some distance back (8 Ahau–13 Pop: the reckoning here is an exact repetition, though in a different style, of the first of the preceding ones) . . . . . (from the) 5 Lamat . . . . . 1 Mol . . . . . (that is) 1 calendar round . . . . . (and) 8 days . . . . . (an unintelligible glyph) . . . . . (from the) 10 Ahau . . . . . 13 Yaxkin . . . . . appearing some distance back.—5 Lamat–1 Mol . . . . . 4 Manik . . . . . 10 Zip (I have no notion what these two isolated dates can mean, unless the former is a mere redundant repetition of the date from which all the reckonings have been made; but the latter has no apparent relation to anything else in the text).—1 cycle . . . . . 9 katuns . . . . . (and) 16 ahaus . . . . . (an unintelligible directive sign; the reckoning, however, is from 10 Ahau–13 Yaxkin, beginning the fouth ahau of the tenth katun of the tenth cycle—showing an abrupt and unaccountable leap forward) . . . . . (to the) twentieth (or beginning) score days . . . . . beginning the twelfth cycle.

The dates and numeral series in this portion of the inscription, taken in the order they come in the figure given above, are as follows:

							Days
						10 Ahau 13 Yaxkin (8 Lamat)	
1			12	9?	8	8 Ahau 13 Pop (9 Lamat)	4,508
						5 Lamat 1 Mol (8 Lamat)	
2			2	4	8	3 Ahau 3 Zotz (6 Ezenab)	808
3	2	9	1	12	1	1 Manik 10 Tzec (3 Ezenab) (353,401)	11,761
4	10	11	10	5	8	5 Lamat 1 Mol (8 Lamat) (1,522,908)	4,508
5					8	10 Ahau 13 Yaxkin (8 Lamat)	8
						5 Lamat 1 Mol (8 Lamat)	
						4 Manik 10 Zip (7 Ezenab)	
6	1	9?	16?	0	0	(no date) (214,560?)	5,780?

The first date (A1, B1) is 10 Ahau 13 Yaxkin; the next (A5, B5) is 8 Ahau 13 Pop. The glyph A2, which is one calendar round, is not included in the intermediate count. The intermediate numeral symbols (A3, B3) are 8 days, 3 or 9 chuens, 12 ahaus. Although there are only 3 dots or balls representing the chuens, they are, from their size

and certain marks on them, interpreted 3 times 3 by Goodman. The next date (A5, B5) is 8 Ahau 13 Pop, followed at C1, D1 by 5 Lamat 1 Mol without any intermediate numeral series. Following the latter date, at C2, D2, is the numeral series 8 days, 4 chuens, 2 ahaus (808 days). This is followed at C3, D3 by the date 3 Ahau 3 Zotz, and this, at D4 to C6 inclusive, by the numeral series 1 day, 12 chuens, 1 ahau, 9 katuns, 2 cycles (353,401 days). At D6 is the symbol for 18 calendar rounds, followed at E1, F1 by the date 1 Manik 10 Tzec; and this is followed, at E4 to F5 inclusive, by the numeral series 8 days, 5 chuens, 10 ahaus, 11 katuns, 10 cycles (1,522,908 days). At F6 E7 is the date 5 Lamat 1 Mol. This is followed immediately (F7) by the symbol for 1 calendar round, and this at G1 by the symbol for 8 days. Following this, at G2, H2, is the date 10 Ahau 13 Yaxkin; and this is followed (H3, in one symbol) by 5 Lamat 1 Mol, and the latter, at G4, H4, by 4 Manik 10 Zip.

Mr Goodman says the reckoning from the first date and generally in this inscription is backward, but it is certain that the count backward of 4,508 days (first series) from 10 Ahau 13 Yaxkin will not reach 8 Ahau 13 Pop, the next date, nor any following date given in the foregoing list. This first date (10 Ahau 13 Yaxkin) is probably connected with some preceding date not included in the portion of the inscription given by Mr Goodman which is now under consideration.

If we count forward 4,508 days from 8 Ahau 13 Pop, year 9 Lamat, the second date (first series of the list), we reach 5 Lamat 1 Mol, year 8 Lamat, the date next following. It is true that both dates come after the numeral series, but this occurs more than once in the inscriptions. If we subtract 808 days (the second series) from 4,508 (first series), the remainder is 3,700 days; counting forward this number of days from 8 Ahau 13 Pop, year 9 Lamat, we reach 3 Ahau 3 Zotz, year 6 Ezanab, the date of the second series. This, it will be remembered, is the rule which seems to prevail in two of the preceding inscriptions.

The next series (3), 11,761 days after the calendar rounds have been subtracted, is followed by the date 1 Manik 10 Tzec. This date Mr Goodman says is a mistake, "as the date at this point is 9 Manik 20 Zotz," which, according to the system I am using, would be 9 Manik 20 Zip. It is certain that 1 Manik 10 Tzec can not be connected by 11,761 days with any preceding or following date, whether the reckoning be forward or backward. If we adopt Mr Goodman's suggestion that the date should be 9 Manik 20 Zip (year 2 Lamat) and count forward 11,761 days, we reach 5 Lamat 1 Mol (year 8 Lamat), the date which follows. Although there is no second connection to confirm this suggestion, I am inclined to think it is probably correct. Counting forward 4,508 days (fourth series) from 8 Ahau 13 Pop, year 9 Lamat (first series), we reach 5 Lamat 1 Mol (year 8 Lamat), the date following the fourth numeral series; and counting eight days (fifth series)

from 10 Ahau 13 Yaxkin brings the reckoning to 5 Lamat 1 Mol, the next following date.

It appears, therefore, from these results that the reckoning so far is forward and not backward, as Mr Goodman maintains.

As the next numeral series (6 in the list given above) has the prefixed numerals, except the 1 (cycle), given in unusual symbols, and there is no recognizable date following within reasonable distance, we will turn to Mr Maudslay's photographs and drawings of the inscription, noticing such additional series only as offer sufficient recognizable data for examination. We take that following the portion which has been examined. This will be found in his photograph, plate 59, vol. IV, and drawing, plate 62, same volume. The numbering and lettering on his plate 62 will be followed. While I feel doubtful as to a number of the glyphs on the plate of drawings, judging by the nearly obliterated forms in the photograph, yet, as Maudslay had an opportunity of observing the original and of carefully studying the casts, I shall accept the drawings generally, expressing doubt where I deem it necessary.

Attention is called first to the somewhat doubtful glyph O7, denoting 7 Cimi 19 Ceh. Following this order, the reverse of the usual (P7 to P8), are the counters 9 cycles, 7 katuns, 11 ahaus, 3 chuens, 0 days (1,350,420 days); subtracting 71 calendar rounds—1,347,580 days—leaves 2,840 days to be counted. As the counters are reversed in order, our count will be backward from 7 Cimi 19 Ceh, year 3 Lamat. This we find will reach 1 Cimi 19 Pax in the year 8 Lamat, the next date, found at O10, P10. As the agreement with the inscription is exact, the count appears to be correct. The cycle and ahau symbols here are face glyphs.

The series commencing with the date 7 Caban 15 Pop (Q6, R6) has as its counters 1 day, 6 chuens, 7 ahaus, 2 katuns (Q7 to Q8), equal to 17,041 days. As 7 Caban 15 Pop falls in the year 6 Akbal, counting forward this number of days we reach 5 Ezanab, the 6th day of Kankin in the year 13 Ben. This agrees exactly with the inscription, as we find 5 Ezanab 6 Kankin farther on at Q11, and the counting in this case is forward, as has been found to be the rule of this inscription with the one exception noted. Counting forward from the last date—5 Ezanab 6 Kankin—2 days 11 chuens (R11) and 9 ahaus (Q12), or 3,462 days, we reach 9 Ahau, the 18th day of the month Zotz in the year 10 Akbal. This is correct, as the latter date is found in the double glyph S1. The last chuen symbol (R11) is a face glyph.

As these are the only series of this inscription presenting data sufficient for satisfactory computation, I will notice one or two glyphs and pass to other inscriptions. At L8 and P5 are ahau symbols, which appear to take the place of katun symbols, but I am unable to prove this by count. In the latter instance there is a date immediately pre-

ceding and dates following, but I am unable to make connections by including or excluding the above symbol, either by counting backward or forward, though the date which follows is clearly determined by a computation, given above.

Tikal Inscriptions

Our next examples will be from the Tikal inscriptions, but here we will use Rosny's photograph of the so-called "Bas-Relief de Bernoulli" (Les Docs., Ecrits de L'Antiq. Americain, Mem. Soc. Ethn. vol. I, 1881), Maudslay's figures not being at hand. Rosny's plates 10–11 represent a standing individual literally overwhelmed with ornaments and overarched by a great serpent, from whose wide-open jaws protrude the head, shoulders, and arms of a human form. In the upper left-hand and right-hand corners are the inscriptions, each of four columns. The carving in this case is on wood. The inscription in the upper left-hand corner is shown in part in our figure 19.

The first two glyphs (A1, B1) represent the date 3 Ahau 3 Mol, which falls in the year 4 Ezanab. At B3, A4 is the next date, 11 Ik, and apparently 15 Chen. The number symbols between these are (B2), 2 days, 2 chuens, and (A3), 2 ahaus, together equal to 762 days. Counting forward 762 days from the first date (3 Ahau 3 Mol), we reach 11 Ik 15 Chen in the year 6 Lamat, which is correct.

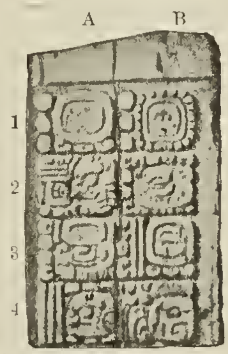


FIG. 19—Part of the inscription at Tikal.

The inscription on plate 12, same work, commences, like the first, with 3 Ahau 3 Mol, but the numbers are too much injured, until the lower half is reached, to trace the series correctly. The seventh glyph in the right column and eighth in the left give the date 7 Ben 1 Pop. Near the bottom are two numeral symbols giving 7 days, 2 chuens and 3 ahaus, equal to 1,127 days, followed by a date 3 Ahau 13 —? the month date being nearly obliterated. Counting forward from 7 Ben 1 Pop in the year 7 Ben 1,127 days, we reach 3 Ahau the 13th day of the month Uo in the year 10 Lamat. This is correct, as the portion of the month symbol remaining is not inconsistent with the Uo symbol in the Dresden codex.

It is noticeable that all the chuen symbols in these two inscriptions are face forms, the ahau symbols ordinary and face forms. It may also be remarked in passing that the glyphs in these inscriptions are the most delicately and tastefully ornamented of any which have so far been found in Central America or Mexico.

On plate 13, same work, is a brief inscription from the same bas-relief. The first date is —? Ahau 13 Pop, the number to the left of Ahau being defaced. Following these are the numerals 18 days, 7 chuens, equal to 158 days, and the date 11 Ezanab 11 —? the month

symbol indicating Chen or Muan, apparently the former. If we assume the day of the first date to be 4 Ahau, the count is correct and the latter date is 11 Ezanab 11 Chen.

Copan Inscriptions

We turn now to Maudslay's photographs of the Copan inscriptions, commencing with that on Stela A, according to the method adopted by this explorer of designating the monoliths of this locality. As Mr Goodman refers to the inscriptions of this place, we will notice his comments so far as is deemed necessary.

STELA A

The great cycle which Mr Goodman numbers 54 being omitted, the remainder of the initial series in which the attached numerals are of the usual form—dots and lines—is as follows: 9 cycles, 14 katuns, 19 ahaus, 8 chuens, 0 days, to 12 Ahau 18 Cumhu. The symbol here interpreted Ahau is an unusual, inclosed face glyph. The two parts of the date are some distance apart, the Ahau at B3 and the Cumhu at B8. After passing over several glyphs, we reach at C15 the symbol for 3 chuens, 0 days, and passing over twelve pair of glyphs reach 4 Ahau 18 Muan. According to Mr Goodman, the first date is to be connected with the second by counting backward. Counting back 3 chuens or 60 days from 12 Ahau 18 Cumhu will bring us to 4 Ahau 18 Muan, but this omits from consideration a number of intermediate glyphs with attached numerals. If the reckoning be correct, it will prove that the face glyph at B3 is Ahau.

STELA B

The initial series on Stela B, like the preceding one, has ordinary numerals prefixed to the time period or order-of-units symbols, though the latter are face characters. This series is 54–9–15–0–0–0, or fifty-fourth great cycle (Goodman's numbering), 9 cycles, 15 katuns, 0 ahaus, 0 chuens, 0 days, to 4 Ahau 13 Yax. According to Goodman's interpretation as applied to his scheme of the Mayan time system, the terminal date of the initial series of this inscription should be precisely 10 chuens or 200 days later in time than the terminal date of the initial series on Stela A; this, however, as will be shown farther on, does not prove to be so.

STELA C

As there are no other recognizable series on Stela B, we pass to Stela C. In regard to this inscription Mr Goodman appears to be in much doubt. His remarks are as follows:

> Nearly everything about this inscription appears to be wrong. The principal reckoning does not accord with the dates given. The initial date to the left is 6

Ahau 18 Kayab, designated by the first glyph to be a certain number of score days in a 13th cycle. As all the dates are indicated to be the beginning of ahaus, this particular date must be in the 13th cycle of the 55th great cycle, as no ahau in the 13th cycle of the 54th great cycle begins with 6 Ahau 18 Kayab. In the 55th great cycle it is 13–2–18–18×20. From this date, according to the glyphs as drawn, there is a reckoning of 11–14–5–18×1 to either another 6 Ahau 18 Kayab or to an 8 Ahau 13 Muan; but such a reckoning would reach neither of those dates—both of which are designated as beginning an ahau—even if there were no odd day or chuen. The only explanation I can conceive is that the reckoning is, or was intended to be, 11–17–5–18×20, which is 5 ahau rounds; and as the same ahau date recurs at each round, the 6 Ahau 18 Kayab would be correct in that event. But this would leave the next date, 8 Ahau 13 Muan, still a mystery, it appearing to have no connection with the preceding dates. As the beginning of an ahau it could not occur anywhere in the vicinity except at 54–12–16–1–18×20. The second section, like the first, begins with a glyph indicating the date to be certain scores of days in the 13th cycle. The day number is given as 15, but of course that is impossible. From a later examination of the stone Maudsley thinks it may be 9 or 5. It is probably the former, the date in all likelihood being—55–13–2–14–18×20—9 Ahau 18 Cumhu. In this event, the character under the ordinary numeral accompanying the month symbol must represent 10. The rest of the inscription is unintelligible, except the two dates, 4 Ahau 18 Uo and 5 Ahau 8 Uo.

Unfortunately Maudslay's photographs of the inscriptions on this stela are not sufficiently distinct and clear to enable us to thoroughly test his drawings by inspection, and the latter are not entirely satisfactory.

The initial series in this instance appears to consist of the single symbol denoting 13 cycles, followed immediately by 6 Ahau 18 Kayab. This, written out after the method adopted, would be 54–13–0–0–0–0, to 6 Ahau 18 Kayab, or fifty-fourth great cycle, 13 cycles, 0 katuns, 0 ahaus, 0 chuens, 0 days, to 6 Ahau 18 Kayab, assuming the date to be in Goodman's supposed fifty-fourth great cycle. However, according to this author, no ahau in his fifty-fourth great cycle begins with 6 Ahau 18 Kayab, but, as he finds by reference to his scheme as shown in his tables, that it does begin the eighteenth ahau (according to his method of counting) of the second katun of the thirteenth cycle of the fifty-fifth great cycle, he places it there. It is apparent from this fact that he has determined the number of the great cycle not by an inspection of the initial or great cycle glyph, but from his system. Has his determination of the numbers of the other two great cycles he mentions been reached in the same way? I am strongly inclined to think that it has, as the process to be followed in determining the numbers from the details of the initial glyphs is not clearly given nor fully explained anywhere in his work.

There is an initial series to another inscription on this stela, but it is unintelligible to me and apparently so to Goodman. There is one numeral series in the first inscription, but it will not connect dates.

STELA D

The inscription on Stela D presents the unusual feature of giving the symbols in the form of the entire body of the person or animal, instead of simply the head, of which a parallel, so far as I am aware, is found only in some of the Mexican codices. No series except the initial one is recognizable. Some aid, however, may be obtained from this singular inscription in determining the signification of the time and numeral symbols. For example, the cycle and katun symbols have each, as an essential portion of the glyph, a bird form in connection with the human figure; the ahau has a nondescript monster; the chuen, what I take to be a frog, and the symbol for the month Zotz (if Mr Goodman be correct in his determination), the figure of a leaf-nosed bat. The grand cycle, or initial glyph, has as the sidepiece (each side) a fish. I am inclined to believe that these figures, which (with the exception of the bat) appear to be unessential for the determination of the time periods or orders of units, are used as symbolic of the names assigned to these periods.

The initial series in this case, as determined by Mr Goodman, is 54–9–5–5–0–0 to 4 Ahau 13 Zotz.

STELÆ E AND F

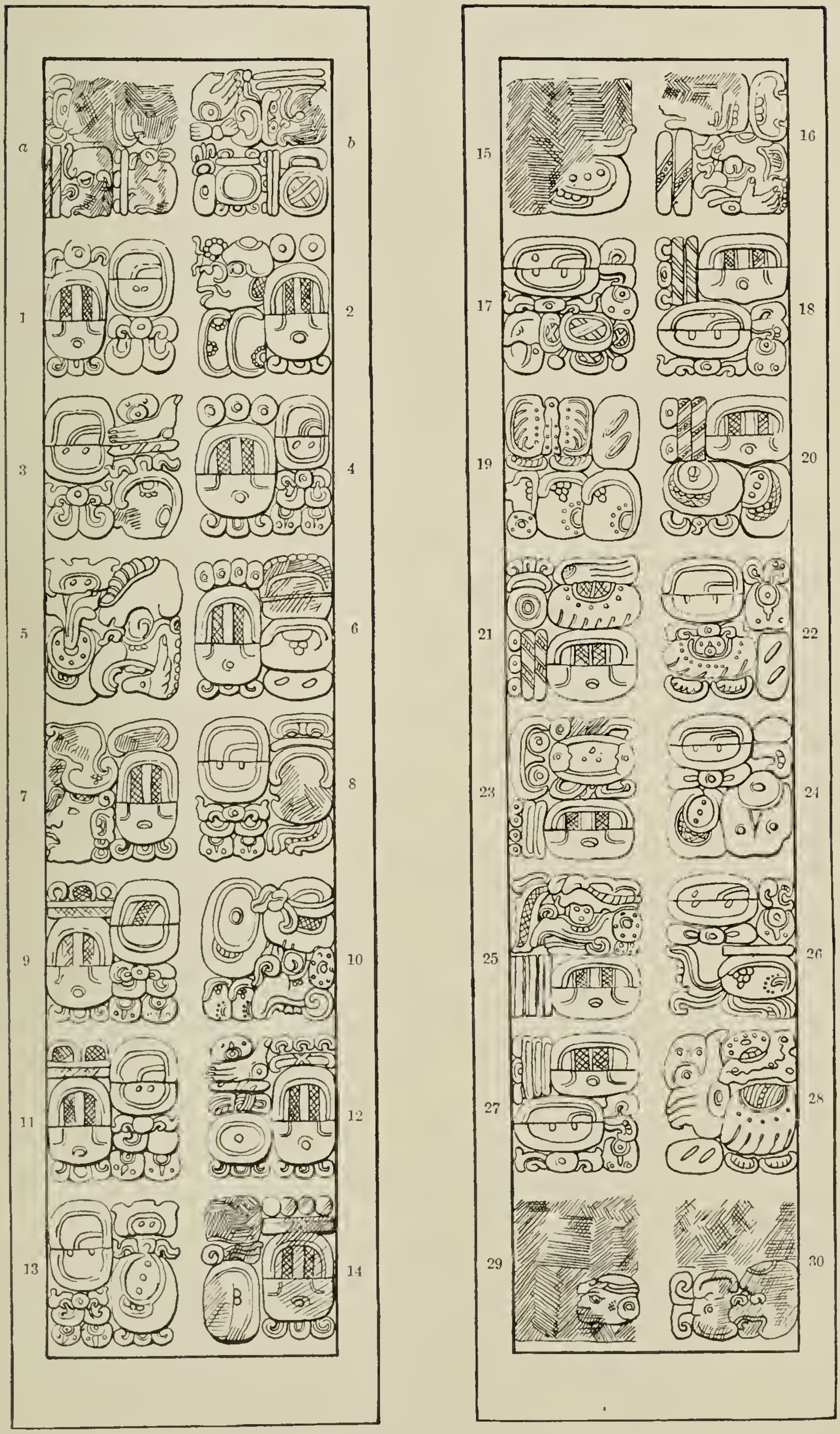
Stela E presents no recognizable initial or other series or determinable dates. The same may be said of Stela F, though Mr Goodman gives an initial series which is confessedly presented "irrespective of the reading of the inscription."

STELÆ H AND I

Passing over Stela H, whose inscriptions present no connected dates, we come to that on Stela I. Fortunately we have good photographs by Maudslay of the inscriptions on this Stela. The initial series as given by Mr Goodman is 54th great cycle, 9 cycles, 12 katuns, 3 ahaus, 14 chuens, 0 days—5 Ahau—"the month date should be 8 Uo, but the glyph which here follows after the initial directive series is obliterated." The ahau symbol is here the figure of a bird's head, and the number a symbol. The month symbol, which Mr Goodman says is obliterated, is, on the contrary, quite distinct, the only injury being a slight break in the attached numeral, which appears to be 8. The month symbol is apparently that of Chen; if of Uo, it is a quite unusual form. However, as this does not connect with any other date, we turn to the inscription on the north side.

Mr Goodman's statement in regard to this inscription is as follows:

> There 10 Ahau 13 Chen is designated as the beginning of a katun—an 8th katun as given * * * There follows a reckoning of 8 days and 10 chuens from 10 Ahau 13 Chen to 10 Lamat—the month date not given, but we know it must be 16 Pop.



INSCRIPTION ON STELA J, COPAN

GLYPHS FROM STELA J, COPAN

Maudslay's photograph of this third row as published in his plate 65 is, so far as the first group, which includes the date mentioned, is concerned, too dim and imperfect to determine the glyphs with even a reasonable degree of certainty, but as Mr Goodman had original photographs, and Maudslay's drawings are more complete, the original inscription may have been clearer than the published photograph (autotype). From the drawing, the Ahau symbol is seen to be of the usual form, but the attached numeral, if it be such, is a face character similar to the second form of 10 given by Mr Goodman. The number 13 over the month symbol is of the usual form (balls or dots and lines); the month symbol is incomplete, but the remaining portion, as given in the drawing, with the exception of the cap piece, which is like that of Chen, is more like Yax, Zac, or Ceh. The symbol for 8 days in the reckoning is separate from the chuen symbol. The number over the chuen is a face form, the same as that noticed above as 10. The 10 Lamat which follows is distinct and of the usual form. It is followed immediately by a glyph with the usual numeral symbol for 9 attached. Although Mr Goodman says "month date not given," this glyph resembles almost exactly that in the inscription on the back, which he calls Uo, but which is more like Chen. The only objection to assuming it to be a month symbol is that Lamat is never the 9th day of the month, but similar errors in this respect have been observed. It is true that if we count 8 days, 10 chuens (=208 days) from 10 Ahau 13 Chen, we will reach 10 Lamat 16 Pop of the following year; but the test is never satisfactory without the month and day of the month, except in case of continued series, as in the codex, where the error, if one is made, can be corrected by the preceding or following differences. Let us in this case change the number attached to the glyph following 10 Lamat to 11, and call the month Chen, which it most resembles. Counting back we vary but one day from 10 Ahau, but the month will be Kayab. This series is therefore not sufficiently certain to decide positively that Mr Goodman's assignment of the number 10 to the face glyph over the Ahau symbol is correct, but we are justified in accepting this face character as a numeral, as characters denoting 0 or 20 are never attached to symbols representing particular days.

STELA J

One of the most important inscriptions at Copan is that on the north and south faces of Stela J, the two sides forming one series. This is shown in plates XLIII*a* and XLIII*b*, which are as nearly as possible copies of Maudslay's drawings, these being selected rather than the autotype, which in some places is a little dim. As the glyphs are all numbered except the upper two on the north side, marked A and B, they will be cited by the numbers.

A slight glance over the inscription is sufficient to call attention to

the frequent repetition of the so-called ahau time or numeral symbol. By beginning with glyph 1 and following down the first two columns and then down the second two as numbered, it will be seen that they have numerals attached, beginning with 1 and proceeding in regular order, 2, 3, etc, up to 16. The remaining numbers, 17–20, do not appear to have been given on the Stela.

As Mr Goodman's comment on this inscription reveals his method of ascertaining numeral characters, it probably will be best to give it in full:

First Ahau—360 Days

Second glyph—The upper character is one meaning beginning, or from the beginning, as we have learned from its use elsewhere with directive and period signs, so there will be no necessity for speaking of it again. The inference is plain that the characters under it represent the number of days in the single ahau that has passed. They consist of a composite sign surmounting two opposed coils—the coil, however, not being as plain in this particular instance as in succeeding ones. We have long suspected all forms of the coil, where it went beyond a mere curve, to be indicative of 9, and the subfix of the ahau symbol has pretty well satisfied us of it. Now, these are identical with the coils in that subfix, but they have not the centerpiece between them which there multiplies them by 4. Hence, these must stand for 18 simply, one of the commonest constituents of 360, the ahau number of days. In that case the other factor must be 20, represented by the composite character above.

Third glyph—Here we recognize the double *cauac* character, which we know stands for 20 days, from its employment in the symbols for the calendar round and cycle. It follows that the head above it must imply 18, but unfortunately it is too mutilated to clearly make out if it has the characteristics of the ordinary 18 face or is a variant.

Second Ahau—720 Days

Second glyph—The same two coils; hence the composite character above them here must denote 40.

Third glyph—The 10-day sign qualified by three characters that should aggregate 72. We should not be able to make them out but for knowledge subsequently gained. If you will look down to the seventh ahau you will see, in the second glyph, the under one of these three characters. Its position there proves it to be 35. The middle numeral is a bar with a band crossing it obliquely in the center—a sign for 9; but here there are two other partial bands, so that presumably it is three times nine, or 27. We are yet ten short of the necessary total. In the top sign, we know the *ahau* stands for 4, the hand ordinarily for 5; but as the upright thumb by itself means 1, the hand in this position evidently has the value of 6.

Third Ahau—1080 Days

Second glyph—One of the coils disappears here and a sign for 3 takes its place. As the 9 element, which is an indispensable constituent of the ahau total, would be lost by addition, this 3 must serve as a multiplier—$9\times3=27\times20=540\times2=1{,}080$. The multiplication also shows us that the duplicate character at the bottom has here but a single value.

Third glyph—The *yax* character which in the month symbol has the value of 4, an outflaring sign which in another inscription distinguishes a fifteenth katun, and a character that must signify 18, to make up the complement of days—$15\times4=60\times18=1080$.

Fourth glyph—We must infer this to be an arbitrary sign, equivalent to a third ahau, or three ahaus.

Fourth Ahau—1440 Days

It will be observed that the reckoning of the days is missing here—a fact that will become important when we reach the next ahau.

Second glyph—As a portion of this is obliterated we will pass it by. It is a waste of time to study illegible glyphs when the missing part is not restorable from what is left or from the context.

Third glyph—Same remarks.

Fifth Ahau—1800 Days

Second glyph—$18\times40=720\times2=1,440$; hence this glyph should have gone with the preceding ahau.

Third glyph—A symbol which appropriately denotes the beginning of a fifth ahau in several other places in the inscriptions. I call attention to the peculiar character of the wing, or whatever it may be termed. It is not the ordinary form, signifying 20, but must have the value of 36—$10\times5=50\times36=1800$.

Sixth Ahau—2160 Days

Second glyph—The under number being 4 here, the character above the coils should represent 30, but instead it represents only 25—$18\times25=450\times4=1800$; hence this glyph should have gone with the fifth ahau.

Third glyph—The 20-day sign again, qualified by a character which the connection requires to be a sign for 108—$108\times20=2160$.

Fourth glyph—An arbitrary sign, probably, for 6 ahaus or a sixth ahau.

Seventh Ahau—2520 Days

Second glyph—$18\times4=72\times35=2520$.

Third glyph—Two of the characters encountered above reappear here, associated with a knot which we know to be a sign for 5 or some of its multiples. As neither 10, 15, nor 20 added to the other characters would form a number that would be an even divisor of 2,520, we must consider this a sign for 5 and the character underneath it to represent 60—$10+27+5=42\times60=2520$. The subfix here, consequently, notwithstanding its resemblance to the character representing 72, can have no value, but must serve merely as a pedestal, as it does under the day symbols.

Eighth Ahau—2880 Days

Second glyph—$18\times40=720\times4=2880$.

Third glyph—$18\times40=720\times4=2880$. The subfix is without value here also.

Fourth glyph—Too defaced to justify any estimate of it.

Ninth Ahau—3240 Days

The computation, if there was one, and the equivalents are defaced beyond the possibility of recognition.

Tenth Ahau—3600 Days

The ahau sign here differs from all the rest. It is the symbol used in a Tikal tablet to denote a date to be a tenth ahau.

Second glyph—The two coils do not appear here, only one; but that one is qualified by a curve, signifying 5. As it can not be added without destroying the 9 element, it must serve as a multiplier—$9\times5=45\times40=1800\times2=3600$. The 2 sign here looks something like the *ahau* character for 4, but the context requires it to be 2.

Third glyph—The symbol that everywhere denotes a tenth ahau or an even 10-ahau reckoning, with the character that commonly constitutes its center placed beside it.

Eleventh Ahau—3960 Days

Second glyph—The stone is so badly mutilated that this glyph can not be restored with certainty. If the characters that are tolerably preserved be 5, 9, and 2, the other should be 44, but I distrust their identity.

Third glyph—There may be two glyphs here, though I think not. The 20-day period being the factor to be raised, it requires 198 for a multiplier to bring it to the necessary total. The character to the left of it being 1, there is good reason for supposing it to represent 73, and the right-hand sign at the top being 18, it follows that there can be no multiplication of these numerals, but that they must be added; hence the remaining characters must aggregate 107. The comb sign—though duplicated here, as in many other places, to give it a more ornamental effect—probably represents but 20. That leaves 87 to be accounted for by the remaining character. It is a sign that occurs many times, but its central part is seldom twice alike, sometimes being a single bar, sometimes two, and again something quite different. Here it has the appearance of the spire in the *akbal* sign, which stands for 7. On either side is a comb sign for 20, raised to twice that value by a line of dots. It is possible, therefore, that the two together may represent 80, the particular center part in this instance raising the full value of the character to 87.

Twelfth Ahau—4320 Days

Second glyph—At first view the principal factors appear to be identical with the characters representing 108 and 18. But the ball in the center of the first is double, and there is cross hatching on both, which may modify the meaning. The character at the bottom seems to be only a beginning sign, though its form is somewhat unusual. If the right-hand sign be 18 and the subfix nothing, the other character must represent 240; but there is too much uncertainty involved to warrant confidence in this deduction.

Third glyph—Here again we are nonplussed. We know the bouquet sign for 6 (the same as that over the symbol for Zac) and the *ymix* character for 5; but the latter has a peculiar marking at the top, and we do not know how that may alter its value. The character over it may be a multiple of 20, as it has the general appearance of the wing sign for that number with a qualifying mark at the left part of it. For a reason that will be made evident later on, we will assume that it represents 120, and the *ymix* character 6—$120\times6=720\times6=4320$.

Thirteenth Ahau—4680 Days

Second glyph—Here the signs for 9, 5 and 4 are plain, indicating that the other character must be 26—$9\times5=45\times4=180\times26=4680$.

Third glyph—The chief factor here is a 260-day sign which we encounter elsewhere. It consists of the *ahau* sign, doubled in value by the surrounding row of dots, and inclosed in the *ymix* character for 5—$4\times2=8+5=13$, and then multiplied by 20, denoted by the duplicate comb sign below—$13\times20=260$. There are just eighteen of these periods in 13 ahaus; hence the character to the right must represent 18.

Fourth glyph—A beginning sign before a glyph that must necessarily be a symbol for a thirteenth ahau or 13 ahaus.

Fourteenth Ahau—5040 Days

Second glyph—There is doubt if this was intended for a single glyph, or if two glyphs were artfully or accidentally mixed up. The characters, moreover, being so nearly illegible that there is no certainty about them, it would be useless to attempt a solution of the puzzle.

Third glyph—A head that appears to be a compound of the chuen and ahau heads. As it probably represents an ahau, the sign in front of it must stand for 14.

FIFTEENTH AHAU—5400 DAYS

Second glyph—The 9, 5, and 4 signs are plain here; the other character, therefore, must be 30.

Third glyph—The 5-ahau character, qualified by a sign that must represent 3—the whole being a symbol for a fifteenth ahau, or 15 ahaus.

SIXTEENTH AHAU—5760 DAYS

Second glyph—A different character qualifies the coil here. It must stand for 4–9×4=36×4=144×40=5760.

Third glyph—The same form of the *ymix* character encountered at the twelfth ahau is again the central figure, but here it has a 20 sign under it, which presumably raises it to 120. If so, it requires to be multiplied by 48 to make up the total number of days. The signs for 18 and 10 leave 20 to be supplied by the other character, which is the skeleton jaw, an invariable sign for 10, here doubled in value by the row of dots in the upper part.

The manner of piecing out the numerals in some of the above instances has been too forced for the result to be regarded as altogether trustworthy. There are also several inconsistencies or errors; but, take it all in all, the number of occurrences in perfect accord with our assumption is too great to be attributable to accident, and we are therefore justified in believing our theory to be correct, however we may have erred in particular applications of it. We have gained a great deal more than is apparent at a first glance. Not only have a considerable number of equivalents for different ahaus and symbols for minor time periods been identified and the value of many new numeral signs established, but—more important than all this—we have satisfied ourselves that there is a plan underlying the employment of a portion of these signs which is capable of almost unlimited variation and extension.

As our investigations so far appear to confirm sufficiently for general acceptance Mr Goodman's interpretation of the symbols denoting the orders of units, or time periods as he terms them, we may now inquire how far the data bear out his announcement of various other numeral symbols. That there appears to be sufficient basis for his idea that certain face characters are used as numerals has already been noticed, though the evidence is as yet not entirely satisfactory as to the values assigned some of them. In his comment on the inscription now under consideration he goes more into detail in this direction, assigning number values to the component parts of and appendages to glyphs. In our examination of this inscription we shall notice briefly some of these ideas as we proceed.

In the paragraph immediately preceding the long quotation given above he remarks as follows:

We start with the assumption that every glyph following a particular ahau represents it or its value in another way. The fact that there is no twentieth ahau—which, so far as the symbol that numeral is attached to is concerned, means no ahau at all—shows that one full ahau, or 360 days, is considered to have passed when the table begins.

Here, at the outset, we are met with an assumption which seems to cover half the ground to be examined. On what grounds does he base the opinion that "every glyph following a particular ahau represents

it or its value in another way?" This, in the absence of proof, is but simple guesswork. However, before we examine it, attention is called to the further assumption that what would, according to his system, be the beginning ahau of the series, which he would number 20, is omitted because it is considered as already passed. He observes in a quotation which will be found on a previous page of this paper, that ahaus are numbered 20, 1, 2, 3, etc., up to 19, but the evidence to establish the correctness of this assertion is nowhere given in his paper. I presume, therefore, that it is based upon the chronologic system that he has constructed, of which further notice will be taken before closing this paper. But how does it happen they are found numbered 1, 2, 3, etc., in an inscription when Mr Goodman tells us that in the katuns, taken in their order, they were numbered 9, 5, 1, 10, 6, 2, 11, 7, 3, 12, 8, 4, 13? That, in telling in a numeral series how many ahaus are to be added, the numbers must be given 1, 2, 3, etc, is very evident; but if ahaus were real periods in the Maya chronology, and not simply units of the third order, as we have stated, why are they not numbered in this inscription in the order in which they come in the katun? It may readily be seen that the succession 9, 5, 1, 10, 6, etc., arose from counting by the day numbers 1–13 by divisions of four, as in the series in the Cortesian codex, the count being backward; as, for example, counting upward from the bottom of one of the other columns in table 3, or by the 360-day periods, as referred to elsewhere and as asserted by Mr Goodman.

He quotes the following from Perez (page 12):

> There was another number which they called *ua katun*, and which served them as a key to find the katuns. According to the order of its march it falls on the days of the *uayeb yaab* and revolves to the end of certain years: katuns 13, 9, 5, 1, 10, 6, 2, 11, 7, 3, 12, 8, 4.

On this he remarks as follows (loc. cit.):

> Poor Don Pio! To have the pearl in his grasp and be unaware of its pricelessness—like so many others! But I must not exult too much yet. The succession of the katuns, reckoned according to this principle, is yet to be ascertained before my fancied discovery can be established by a crucial test. I score the ahaus off in the foregoing order, and, sure enough, the twentieths give the desired result: 11, 9, 7, 5, 3, 1, 12, 10, 8, 6, 4, 2, 13. Eureka! The perturbed spirit of the Maya calendar, which has endeavored so long to impart its message to the world, may rest at last.

As the "uayeb haab" signifies the five added days of the year and is so recognized by him, how is it possible to reconcile this count, which "falls on the days of the uayeb haab," with the count of his ahaus which only cover 360 days each and recognize no 5 added days, which only come into notice when the year of 365 days is considered, which he says the Maya left behind when they entered on a chronologic count? It seems doubtful, therefore, whether this explanation will allay "the perturbed spirit of the Maya calendar."

By reference to his comment on the ahaus of this inscription, as quoted above, it will be seen that he uses the coils and other parts of the attached and accompanying glyphs as multipliers, assigning values to them that bring out the desired number. It is unnecessary to follow his process, as it is given fully in the quotation. But all this is presented without proof that the values assigned are correct, or, in fact, that the characters are number symbols. Until evidence rendering such interpretation at least probable is presented, it is nothing more than a guess. However, it must not be taken for granted that I reject all these symbols and appendages as not indicating numbers, as two or three already noticed (besides face characters) appear from satisfactory evidence to have been used as numerals; and it will be seen farther on that there are reasons for believing there are some appendages which are also thus used. The point made above is that Mr Goodman fails to present reasons for his assertions in this respect, which necessitates going over the entire record to verify or disprove them.

That the symbols in this inscription which Mr Goodman designates by the name "ahau" are to be counted as equivalent to 360 days each must be admitted, but the name ahau, it must be remembered, is, as applied here, merely an arbitrary designation, and its use is wholly different from that made of it by the natives, so far as the preserved records show.

ALTAR K

The inscription on Altar K contains nothing recognizable save a portion of the initial series which is given by Mr Goodman as follows: 54–9–12–16–7–8—3 Lamat 16 Yax, or fifty-fourth great cycle, 9 cycles, 12 katuns, 16 ahaus, 7 chuens, 8 days. As no photograph is given by Maudslay, we have no means of testing his drawing (plate 73, part 3). The prefixed numerals in this case are the usual dots or balls and short lines, but are not sufficiently distinct to verify Goodman's interpretation; in fact, the number prefixed to the chuen symbol looks more like 10 than 7—is 10 if Maudslay's drawing be accepted—and the day glyph is wholly obliterated. The series and date as given by him are therefore largely conjectural, the latter having evidently been obtained by calculation according to his system, and not from an inspection of the inscription.

STELA M

The initial series on Stela M, as given by Goodman, is 54–9–16–5–18–20—8 Ahau 8 Zotz, or, changing the 18 and 20 to 0, as we have found to be correct, the fifty-fourth great cycle, 9 cycles, 16 katuns, 5 ahaus, 0 chuens, 0 days, to 8 Ahau 8 Zotz. The prefixed numerals in this series are of the usual form, balls and short lines, and agree with Goodman's interpretation.

STELA N

Of the inscriptions on Stela N, Maudslay gives both photographs and drawings, the former somewhat indistinct, but the latter very clear. The initial series on the east side as given by Mr Goodman is as follows: 54–9–16–10–18–20—1 Ahau 8 Zip, or as we write it, fifty-fourth great cycle, 9 cycles, 16 katuns, 10 ahaus, 0 chuens, 0 days to 1 Ahau 8 Zip. This is correct, if the month symbol, which is inverted and stands at some distance from the day glyph, has been correctly interpreted, sa the prefixed numerals are of the ordinary form and distinct. Mr Goodman says "the month symbol is wrong; it should be 3 Zip." This is true if we accept his theory that the count is to be from 4 Ahau 8 Cumhu, the assumed initial date of his fifty-fourth great cycle.

As an important question arises in regard to the series on the west side of this Stela, we quote the following from Mr Goodman in regard to it:

> At the top of the second column occurs the sign that indicates a reckoning backward. It is followed by seven glyphs, which I think give in another form the substance of the subsequent reckoning, which is the longest that occurs in any of the inscriptions, embracing a period of 75,264 years. It is given as 14–17–19–10–18×20 from the initial date to 1 Ahau 8 Chen, the beginning of a katun, etc. The reckoning is not only wrong, but is absurd as well. The cycles run only to 13, and no such reckoning backward or forward from the initial date would reach a 1 Ahau 8 Chen. But fortunately, despite all the blundering, we can see what the intention was. 1 Ahau 8 Chen begins the 17th katun of the 8th cycle, and thence to the initial date is just 19 katuns and 10 ahaus. The fact that these are the numbers of katuns and ahaus expressed in the reckoning would lead us to suspect that it was to go backward even if the directive sign had not already so informed us, for that would do away with the odd katuns and ahaus and leave the reckoning in even katun rounds. If it were to have gone forward, the odd numbers would have been 3 great cycles, 7 cycles, 9 katuns, and 10 ahaus. A little figuring will show the difference. . . . It will be borne in mind that 3 great cycles, 8 cycles, and 9 katuns are the equivalent of a katun round—that is, the time that must pass between two occurrences of any given date as the beginning of a katun.
>
> In thinking of the odd 19 katuns and 10 ahaus, they blundered in respect to the total period. I think it should be 14–8–15–10–18×20. If so, the reckoning goes back to the 40th great cycle; if it went forward, it would extend to the 69th. It is not material which way it be decided. The important fact is that in either case they ranged over a period of more than 75,000 years, which substantially proves my estimate of the immense reach of their chronological calendar. There are a few glyphs following the reckoning and date in the same column, but they do not assist us, nor can anything beyond the dates and a few disconnected characters be made out of the rows of glyphs around the base.

The numbers of the long series mentioned are given correctly except as to the 18 and 20, which should be 0. The reading as it stands in the inscription is as follows: 0 days, 0 chuens, 10 ahaus, 19 katuns, 17 cycles, 14 great cycles, to 1 Ahau 8 Chen. This series, as it clearly stands in the inscription, seems, as has been noted on another page, positive evidence against Mr Goodman's theory that 13 cycles make 1 great

cycle, or, according to the nomenclature we have suggested as correct—that 13 units of the fifth order make one of the sixth order. It would indicate (unless it can be shown that the 17 cycles is an error) that the system in use at Copan was the same as that in the Dresden codex, the count being 20. It is true that the series will not connect the first date (1 Ahau 8 Zip) with the 1 Ahau 8 Chen which follows, but the length of the series indicates, as we have so often found the case, that the count is back to some initial date. The order of the series, notwithstanding Mr Goodman's contrary opinion, seems to indicate that the count is forward to 1 Ahau 8 Chen. Counting back from 1 Ahau 8 Chen, year 3 Ben, we reach 12 Ahau 13 Zotz, year 5 Lamat, which would be the initial date.

Counting 20 cycles to the great cycle, as we are justified in assuming is correct, would of course put out of order Mr Goodman's tables so far as they relate to great cycles and the numbering of the cycles, though it would not affect the order of the katuns. The date 12 Ahau 13 Zotz is, as we find by his table, the first day of the sixth katun, sixth cycle of his fifty-fifth great cycle. This, however, will be further noticed when we come to the discussion of the initial series.

STELA P

I pass by Stela P, as I believe Mr Goodman's interpretation of the initial series (the only part noticed by him) to be largely guesswork, and as there are no recognizable minor series.

ALTAR Q

We turn next to the inscription on the top of Altar Q, of which Maudslay gives a large and clear photograph and a good drawing. This is to be read by double columns, as usual, commencing at the upper left hand. The first two glyphs give the date 5 Caban 15 Yaxkin. Passing over three characters, we reach another date, 8 Ahau 18 Yaxkin. There is no intermediate numeral series, but a reference to our table 1 will show that these two dates are but 3 days apart. At the bottom of the first column is the symbol for 12 days, 7 chuens, which is followed at the top of the third and fourth columns by 5 Ben 11 Muan. The 12-day numeral to the left of the chuen symbol should certainly be 13, notwithstanding the fact that Maudslay's drawing gives it as 12. An inspection of his photograph shows a middle prominence which appears to be part of a ball, though he renders it without any evident reason a cross. Counting forward 7 months and 13 days in the year 1 Akbal (in which these dates fall), on our table 2, from 8 Ahau 18 Yaxkin, we reach 5 Ben 11 Muan, which is correct. At the bottom of the third column is the symbol of 17 katuns, which does not appear to be a counter, but which Mr Goodman interprets seventeenth katun. Following this at the bottom of the fourth column is 6 Ahau, and at the top of the fifth column 13 Kayab. The next date, which is

at the bottom of the fifth column, is 5 Kan 13 Uo, between which and the preceding is the counter 4 days, 3 chuens, equal 64 days. As 6 Ahau 13 Kayab falls in the year 12 Lamat, we count forward 64 days from this date, which brings us to 5 Kan, twelfth day of the second month (Uo) in the year 13 Ben. This is correct, as Kan may be the twelfth day of the month but not the thirteenth.

The date glyphs in this inscription are of the usual form found in the Dresden codex, and the minor numerals the ordinary dots or balls and lines; and with the slight and evidently necessary corrections noted, the series conform to the rule. However, there is a break in the interpretation and calculation which remains unexplained. From 5 Ben 11 Muan, which is in the year 1 Akbal, as the preceding date, to 6 Ahau 13 Kayab in the year 12 Lamat, there is a forward jump of 37 years and 42 days unaccounted for. This appears to indicate that the 17 katuns passed over (bottom of third column) and possibly some other number glyphs should be brought into the count. Mr Goodman merely says (page 134):

> An unintelligible reckoning follows [5 Ben 11 Muan], succeeded by a 17th katun sign and 6 Ahau 13 Kayab, the date probably being indicated by the one beginning the 5th ahau of the 17th katun of the 9th cycle.

ALTAR S

We refer next to Maudslay's Altar S, the initial series on which, as given by Goodman, is 54–9–15–20–18–20—4 Ahau 13 Yax, or as we write it, fifty-fourth great cycle, 9 cycles, 15 katuns, 0 ahaus, 0 chuens, 0 days, to 4 Ahau 13 Yax. These numbers appear to be correct except the katuns, Maudslay's drawing showing 13 or 11. There are two short lines and three balls or dots, but the two outer ones are darkened with lines indicating that they may possibly be loops. Mr Goodman appears to have changed the number of katuns in this case to form connection with 4 Ahau 8 Cumhu, beginning day of his fifty-fourth great cycle, without explanation.

On this altar we find very distinctly shown these dates, 4 Ahau 13 Yax and 7 Ahau 18 Zip. Between the two are four glyphs, one of which indicates 5 katuns. This count (36,000 days) precisely connects the two dates.

We have now noticed all the series of the Copan inscriptions which afford any means of testing Mr Goodman's discoveries, following his explanations so far as this was necessary.

Inscription at Piedras Negras

Before concluding reference to the inscriptions, I call attention to one more recently discovered by Mr Teobert Maler at Piedras Negras on the Usumacinta river. This, as copied from Mr Maudslay's drawing, which he made from the photograph, is given in our figure 20. As Mr Maudslay has subjected it to Mr Goodman's theory, we give here

the result in his own words, after stating that the initial series as Goodman would read it is 54–9–12–2–0–16 to 5 Cib 14 Yaxkin:

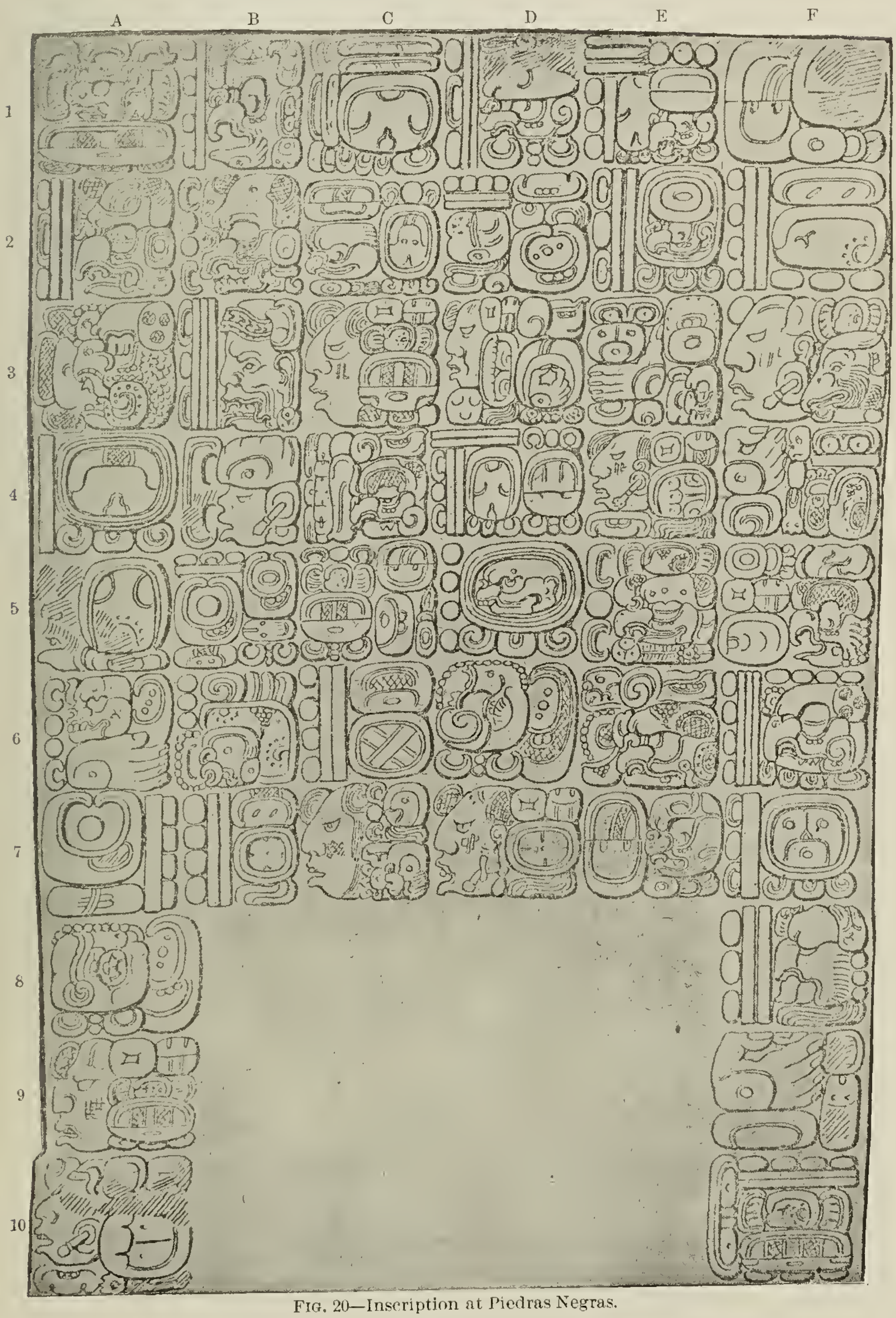


Fig. 20—Inscription at Piedras Negras.

The next three glyphs are undeciphered; then comes another reckoning:

C1 is the chuen sign with the numeral 10 (two bars=10) above it, and a "full count" sign at the side. Whether the 10 applies to the chuens or days can only be

determined by experiment, and such experiment in this case shows that the reckoning intended to be expressed is 10 chuens and a "full count" of days—that is, for practical purposes 10 chuens only, for as in the last reckoning, when the full count of chuens was expressed in the ahaus, so here the full count of days is expressed in the chuens.

The next glyph D1 is an ahau sign, preceded by the numeral 12. This gives us:

	Days
12 Ahaus (12×360)......	4, 320
10 Chuens (10×20)......	200
	4, 520
	4, 380=12 years
	140

Adding 4,520 days, or 12 years and 140 days, to the date 5 Cib 14 Kankin it brings us to the date 1 Cib 14 Kankin in the thirteenth year of the annual calendar.

Turning to the inscription we find at C2 (passing over the first half of the glyph) 1 Cib followed by (the first half of D2) 14 Kankin, the date at which we have already arrived by computation.

Passing over the next three glyphs we arrive at another reckoning. D4 gives 10 days 11 chuens 1 ahau, and the first half of C5 gives 1 katun.

	Days
1 Katun	7, 200
1 Ahau..................	360
11 Chuens (11×20)	220
10 Days	10
	7, 790
	7, 665=21 years
	125

Adding 7,790 days, or 21 years and 125 days, to the previous date, 1 Cib 14 Kankin, it will bring us to 4 Cimi 14 Uo in the thirty-fifth year of the annual calendar, and we find this date expressed in the inscription in the glyphs D5 and C6.[1]

Passing over the next three glyphs we arrive at another reckoning (E1), 3 ahaus, 8 chuens, 15 days:

	Days
3 Ahaus.......	1, 080
8 Chuens......	160
15 days	15
	1, 255
	1, 095=3 years.
	160

Adding 3 years and 160 days to the last date, 4 Cimi 14 Uo, brings us to 11 Ymix 14 Yax in the thirty-eighth year of the annual calendar; this is the date we find expressed in the glyphs E2 and F2 of the inscription.

It is true that in the sign in the glyph E2 is not the sign usually employed for the day Ymix, but that it is a day sign we know from the fact that it is included in a

[1] He counts the side number of chuen symbol, chuens.

cartouche, and I am inclined to think that the more usual Ymix sign (something like an open hand with the fingers extended) was inclosed in the oval on the top of the grotesque head, but it is too much worn for identification.

Passing over seven glyphs, the next reckoning occurs at F6, which gives:

	Days
4 Chuens......	80
19 days	19
	99

Adding 99 days to the last date, 11 Ymix 14 Yax, brings us to 6 Ahau 13 Muan in the same year, and we find this date expressed in F7 and F8.

The last glyph in the inscription is a Katun sign with the numeral 14 above it, and a sign for "beginning" in front of it, and indicates that the last date is the beginning of a fourteenth katun. If we turn to the table for the ninth cycle of the fifty-fourth Great Cycle, from which we started, it will be seen that the fourteenth Katun of that cycle does commence with the date 6 Ahau 13 Muan.

It is simply impossible that the identity of the dates expressed in the inscription with those to which the computations have guided us can throughout be fortuitous.

Summary

Having now concluded my examination of the inscriptions, I may state that I am satisfied on the following points: That the signification and numeric value of the symbols (each represented in two or more forms) which Mr Goodman names, respectively, day in the abstract, chuen, ahau, katun, cycle, and calendar round, are as indicated above and must be accepted as correct; that the usually large (quadruple) initial glyph represents the sixth order of units, or, as Goodman terms it, great cycle; that certain face characters and also some two or three characters not face glyphs are used as number symbols. These are undoubtedly the most important discoveries yet made in regard to the signification of the glyphs in the inscriptions; and although they seem to throw but little light on the codices, they must influence, to a considerable extent, attempts at interpretation of these records.

The use of face characters for days and time periods should not be considered as something peculiar to the inscriptions, as an examination of the codices will show that this change of ordinary symbols into face forms is by no means unusual. In the Troano codex the symbol for the day Eb is oftener a face form than otherwise, and those for the days Men and Oc are often changed into faces. The symbol for the day Ix is occasionally radically changed so as to represent a face. A remarkable change in the Chicchan symbol in order to give it a face form is seen in plate 31. In one or two instances, as on plate 23, what are presumed to be symbols for the ahau have a prefixed face character possibly denoting a numeral.

We pass now to the consideration of some other questions which are brought up by this investigation.

MR GOODMAN'S SYSTEM OF MAYAN CHRONOLOGY

First, I will explain briefly Mr Goodman's interpretation of the ancient Mayan system of chronology. It must, however, be borne in mind that his "archaic chronological calendar" or system is distinct from the well-known Mayan calendar system comprising years of 365 days and 18 months, 52-year cycles, etc.

Attention has already been called to his time periods from the day up to and including the cycle, and also to the fact that these are identical with the orders of units in the Mayan system of notation, a fact which seems to negative the idea that they should be called time periods. These periods, with his names and the values assigned them, are as follows:

	1 day.
20 days make	1 chuen.
18 chuen make	1 ahau.
20 ahaus make	1 katun.
20 katuns make	1 cycle.
13 cycles make	1 great cycle.
73 great cycles make the grand era.	

If we follow him carefully throughout his work, it becomes apparent that, after he had arrived at the conclusion that the orders of units or steps in notation were veritable chronologic periods, it was a natural consequence that he should conceive the idea that the system must reach back to a number or period that would round out evenly as a great common multiple of all the lower factors. This is apparent from the following passage near the commencement of his paper:[1]

If, as is probable, a more satisfactory answer should be found by many in the assertion that I am in error as to such an era, and I be asked how I know that it exists, my reply would be that it is self-evident. Its existence is established by all the certainty of mathematical demonstration. The evidence of the inscription does not go hand in hand with us to the ultimate destination, but it leads us far on the journey, and leaves us only when it has pointed out an unmistakable way to the final goal, which an intellectual necessity compels us to reach before we can rest satisfied. The inscriptions show us that every separate chronological period must be rounded out to completeness before the calendar itself can be complete. We see the years, ahaus, and katuns come back to their respective starting-points, thus rounding out the periods of which they are the units. Of necessity the cycles and great cycles must do the same, else the system would be an incomplete creation, without form and void. No fair-minded person, I think, will contend that the Mayas elaborated almost to its conclusion a design not only susceptible of but inviting the most perfect finish and then willfully or blindly left it disproportioned and awry. If they did not do this—a thing alien and repugnant to human nature—then their grand era embraces 374,400 years. There are two unmistakable indices pointing to this conclusion. The moment the cycle and great cycle appear upon the scene we know by the unchangeable law governing the calendar that they must go forward until they commence

[1] The Archaic Maya Inscriptions, p. 6.

again with the same date from which they started. Such a result in the case of the former requires 949 cycles, and in that of the latter 73 great cycles, each of which reckonings constitutes a period of 374,400 years.

It is also apparent in the following expression (p. 26):

The grand era is composed of seventy-three great cycles and comprises 374,400 years, or 136,656,000 days. It is the period in which the Maya chronological calendar completes itself, just as their annual calendar does in a period of 52 years.

This number of days is the product of the factors $20\times18\times20\times20\times13\times73$. Now let us examine his reason for introducing the 13 and 73 instead of carrying on the count according to the usual Maya vigesimal notation, as Dr Förstemann has done. This is easily seen. Having conceived the idea that all the factors of the calendar system are time periods and must come into harmony in the highest period, it was absolutely necessary to bring these prime numbers into the count. The 13 is necessary to the day numbering and to the 52-year period (4×13), and the 73 to the 365-day period (5×73), and as 4 and 5 are factors of the lower periods (as 20) the prime numbers only were necessary to complete the scheme. As the attempt to introduce both these into one period would have required the use of the very large multiplier 949 (see his use of it, p. 27), the 13 was introduced into the grand cycle. We might ask, and seemingly with good reason, why not in one of the lower orders? The answer is apparent—the records show beyond question that, up to the cycle, the multiplier, except in the case of the chuen, was 20. But in passing from the cycle to the grand cycle, but a single example has been found in the inscriptions showing a higher number than 13, and this, as has already been stated, Mr Goodman decides must be erroneous.

As the introduction of the 13 somewhere is absolutely necessary to round out his grand multiple, how, we may ask, was the system completed in accordance with the Dresden codex which he admits (page 3) "pertains to the archaic system in the main, though reckoning 20 cycles to the great cycle"? Unless 949 is introduced as a multiplier in the next step, which can not be supposed possible, the entire scheme is destroyed and the several steps reduced merely to those of notation, which in fact they are. The idea that the Mayan tribes of Chiapas, Guatemala, and Honduras had such a magnificent rounding-out system, while the Yucatec tribes, though having a system similar in other respects, failed to introduce the rounding-out factors, is, to say the least, very strange. In order to include the 365 days of the year in the great multiple, it was also necessary to introduce the prime number 73, which is not a divisor of any of the lower periods. This explains Mr Goodman's theory of a great cycle composed of 13 cycles and a grand era composed of 73 great cycles, as he could not otherwise have a general rounding-out period. These are of course necessary to this scheme, but the crucial question is, did the Maya have any such scheme,

or ever imagine such a one? Where is the proof to be found? The fact that the scheme works out nicely according to the figures is no evidence that it was ever in use, ever adopted, known, or even imagined by the most advanced Mayan priest.

Speaking of the grand era, his great rounding-out period, Mr Goodman says:

> As the existence of this period is very likely to be questioned, I will give my reasons more fully here for believing in such an era. The numbers 73 and 949 are as important factors in the Maya chronological scheme as 13 and 20. This results from two features of the system not hitherto touched upon, which may very properly be termed the minor and grand rounds of the periods. After 73 occurrences, and not until then, every period of the chronological calendar begins again with the same day of the same month, but (with the exception of the burner and great cycle) with a different day number. This is the minor round. Thirteen of these, or 949 occurrences, constitute the grand round, when the periods begin again not only with the same day of the same month but with the same day number.

There is no doubt that the calculation here is all right, and that 73, 13, and their multiple, 949 (73×13), will be divisors of any product of which they have been multipliers. Hence there can be no question that the results he gives in the two tables following the paragraph quoted are correct, but after all he is simply taking apart the pieces he has put together. In other words, no amount of figuring in this way will furnish proof that such a scheme as his was in vogue among the Maya. That they did have a notation with the following multipliers: $20\times18\times20\times20$, and another, presumably 20 (admitted by Mr Goodman to have been 20 in the Dresden codex) we know; but it can hardly be granted that the great scheme he has built up on this foundation is justified. There is just as much evidence, in fact much more, that the count went on after the second order of units according to the vigesimal system, than that Mr Goodman's scheme was in vogue.

That there was a count or order of units above the fifth or cycle is evident both from the codex and from the inscriptions, and I am inclined to believe, as heretofore stated, that Mr Goodman is right in interpreting the large initial glyph of the Tablet of the Cross, Palenque, and the other similar initial glyphs as the symbol of such count, order of units, or great cycle, as he prefers to call it. But I find no evidence in the codices or inscriptions that the count was ever carried beyond this sixth order of units or great cycle, though there is nothing in the system to prohibit it more than there is to prevent counting beyond billions in the decimal system. That this order of units appears to have been the limit of computation is inferred in part from the prominence and position given the symbol, and from the fact that no higher count has been found. Although there is no satisfactory evidence in the inscriptions of the numbering of these so-called great cycles, except the series on Stela N, Copan, yet it is known from the Dresden codex that they were numbered; but the limit, unless we assume that it was governed by the vigesimal system, is unknown.

That the symbols of this order forming the initial glyph of various series in the inscriptions differ in some of their parts and appendages is evident, but that these elements and appendages are used to indicate numerals has not yet been established by Mr Goodman, as is evident to anyone who will examine his explanation of the ahaus on Stela J of Copan in the quotation given above, which shows his method of arriving at the numbers indicated by glyphs. There is too much guessing in the building up of numbers by piecing together the parts to justify acceptance by those who are in search of positive results.

I have stated again and again that I believe the so-called time periods to be nothing more than the orders of units used by the Maya tribe in its system of notation. That they are the same up to the cycle, or fifth order, is known from the evidence furnished by the codices and inscriptions; and that the same vigesimal system is continued to the sixth order in the Dresden codex is admitted by Mr Goodman and proved by the series on plate 31, which has been given above (page 728). As positive proof that the nineteen cycles here are to be counted it is only necessary to state that the series connects with 13 Akbal, which may be that below or that to the left above. Let the count be either way, it begins and ends with this date.

The great time series on Stela N of Copan heretofore mentioned, which Mr. Goodman brushes aside as "not only wrong but absurd as well," deserves more consideration than has been given it. The attached numerals are of the ordinary form—balls and short lines—and are quite distinct in Maudslay's photograph and drawing. It is absolutely necessary to Mr Goodman's theory as to the Maya time system that this series be effectually disposed of. And yet, so far as any evidence bearing on the case can be found, there is no other reason for rejecting it than that it conflicts with a theory.

This series as given in the inscription is as follows: 14–17–19–10–0–0, or, written out, 14 great cycles, 17 cycles, 19 katuns, 10 ahaus, 0 chuens, 0 days. This is an immense stretch of time, amounting to 42,908,400 days, or 117,557 years and 95 days, counting 20 cycles to the great cycle, as I believe is correct, or over 75,000 years, counting 13. The great cycle symbol is in this case a face character, as are the cycle, katun, and ahau symbols. The chuen symbol, which has the days attached, is of the usual form. The day which follows is 1 Ahau 8 Chen.

If we assume that the 1 Ahau 8 Zip which terminates the initial series and is found in the column on the east side of the Stela is to be connected by the long series with the 1 Ahau 8 Chen in the column on the west side (the series being in the same column), it is true, as Goodman remarks, that the numeral series as given will not make the connection. But this fact is by no means conclusive evidence that there is an error in the series; for, in the first place, taking into consideration

the fact that there is an inscription running around the base which may or may not be a part of the whole, it is by no means certain that the aboriginal artist intended to connect these two dates by this numeral series; and, in the second place, it is possible and even probable that this long series was intended to connect the following date with some preceding initial date, as Mr Goodman insists is true with regard to series in several other inscriptions. Nor is it a rare occurrence that the first following date does not connect with the terminal date of the initial series. We think, therefore, that it is more reasonable and more in accordance with the rule in other inscriptions to conclude that this numeral series was intended to connect the date which follows with some initial date, and this, unless the count was forward, which Mr Goodman does not admit, would be far back of 4 Ahau 8 Cumhu, the first day of his fifty-fourth great cycle, to which he has commonly referred. As will be seen by reference to the quotation given above from his remarks on this series, he accepts as correct the 14 great cycles, places the date 1 Ahau 8 Chen in his fifty-fourth great cycle, and carries back the count from that date, reaching the fortieth great cycle. It is evident, therefore, on his theory, that it was not the intention to connect the two dates 1 Ahau 8 Zip and 1 Ahau 8 Chen by this series, as both, according to his own showing, fall in the fifty-fourth great cycle. As proof that this is his view, we quote his words: "I think it should be 14–8–15–10–18 × 20. If so, the reckoning goes back to the fortieth great cycle; if it went forward it would extend to the sixty-ninth." As he says (p. 148) that the latest date of the inscriptions is "55–3–19–2–18 × 20," and in another place that Mayan count always related to past time, it is clear that he carries this count back 14 great cycles from the fifty-fourth.

It follows, from the conclusion reached in the preceding paragraph, and from Mr Goodman's scheme, that, counting back from 1 Ahau 8 Chen, the "8–15–10–18 × 20" of the series "14–8–15–10–18 × 20," as he corrects it, should bring us to 4 Ahau 8 Cumhu, the commencement of his fifty-fourth great cycle; but it does not bring this result. It must also be admitted that, counting back, the 17–19–10–0–0 of the series as it stands in the inscription will not bring us to 4 Ahau 8 Cumhu. But it must be borne in mind, as has been stated, that counting 20 cycles to the great cycle or sixth order of units (as there are good reasons for believing is the proper method) would break up the order of Goodman's tables so far as they relate to the great cycles and the numbering of the cycles, though it would not affect the order of the katuns. The cycles, katuns, and lower periods would follow in regular order, the initial days of each depending on the day with which the count begins. As 17 is given as the number of cycles, it seems clear (unless evidence to the contrary be presented, which Mr Goodman

fails to do) that the theory of 13 cycles to the great cycle is erroneous and that the count follows the vigesimal system, as in the Dresden codex. It is significant, however, that by simply changing 1 Ahau 8 Chen to 13 Ahau 8 Chen, counting back 17–19–10–0–0 we reach 4 Ahau 8 Cumhu.

Moreover, if the Dresden codex, which, so far as appears, follows the same time system that is found in the inscriptions, can have correctly 19 cycles, where is the evidence to be found that 17 cycles would necessarily be erroneous in the inscriptions? Mr Goodman's objection seems to rest wholly on his theory of the chronologic system. This is insufficient to justify belief in such a radical difference between the systems of two records which in all other respects are so nearly alike.

Following Mr Goodman's interpretation of numeral symbols, an additional fact bearing on this question, we find in certain details of the great cycle and katun symbols. According to him, the comb-like figure similar to those on the katun symbol has the value of 20. If it plays any part in making up the numerical value of the katun, it may reasonably be assumed that it performs a similar office in connection with the great cycle symbol, of which it is a usual accompaniment. It is true that Mr Goodman has furnished no proof that this particular character is a numeral symbol denoting 20, but in accordance with his theory it should have the same value in connection with the great cycle glyph as elsewhere.

In this series we have the only evidence in the inscriptions of which I am aware that the great cycles were numbered, 14 being the highest number given. But this numbering is just as the numbering of our thousands or millions; we say 10 thousand and 10 million. In the Dresden codex four of these periods are noted in some four or five series. These are the highest counts, so far as is known, that the Maya reached, their notation seeming to have spent itself in the sixth order of units. We conclude, therefore, that, though the data are not sufficient to settle all these points by absolute demonstration, as all the evidence obtainable is against the theory of 13 cycles to the great cycle and in favor of 20, and as the only evidence as to the numbering of the great cycles indicates that they go above 13, it is safest to assume that the vigesimal system was followed throughout after the count rose above the chuen or second order of units.

It is often justifiable to advance into the field of speculation in order to clear away so far as possible obstructions to advancement and to fix the limits of investigation, but the result of speculation can not safely be used as a factor in mathematical demonstration, and Mr Maudslay has candidly stated the necessity for further investigation in this respect.

We have noticed the numbering of the ahaus by the day numbers,

thus, 9, 5, 1, 10, 6, 2, 11, 7, 3, 12, 8, 4, 13, 9, 5, 1, etc. Selecting, in a continued series of days in proper order, with the day numbers attached, any day Ahau, for instance 1 Ahau, and counting forward 360 days (Goodman's ahau period), we find that the next 360 day period begins with 10 Ahau; that the third period begins with 6; the next with 2; the next with 11, and so on in the order given above. But the same is true if we select any other day, as 1 Akbal in our table 1, or begin at any point in the continued series, counting 360 days to each step.

As Mr Goodman holds that each ahau begins with the day Ahau, it follows, according to this system, that the katuns, which contain just 20 ahaus, must begin with the same day. By this it results that katuns begin with day numbers running in the order 11, 9, 7, 5, 3, 1, etc.

This is apparent if we write out the ahau numbers—the 9, 5, 1, 10, etc.—in a continuous series and take each twentieth one. As there are twenty katuns in a cycle, the latter must also, according to this system, begin with the day Ahau. Writing the numbers 11, 9, 7, 5, 3, 1, etc., in a continuous series, and taking each twentieth one, the result will be the series 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1, 13, 12, 11, etc. If the correct count be, as Mr Goodman asserts, 13 cycles to the great cycle, the latter will all begin with the same day and same day number, but if 20 be the correct count, then the order will be 11, 4, 10, 3, 9, 2, 8, 1, 7, 13, 6, 12, 5, 11, 4, etc.

But after all, this kind of figuring is a mere source of amusement except where the knowledge conveyed may aid to more certain and rapid counting. It is as though we were to take the days of our almanac in regular order as named, beginning the first hundred with Sunday; the second hundred would begin with Tuesday, and so on. By taking these and placing them in consecutive order we could pick out every tenth one as the beginning of the thousands. This might amuse us, and might under possible circumstances be an aid to us in counting time, but it would be no explanation of our calendar system, and would not be a part, but a result thereof.

That these ahaus or 360-day counts always began, as Mr Goodman asserts, with a day Ahau, is not proved; moreover, there is no reason for believing the assumption to be correct, but there are on the contrary, good reasons for believing it to be incorrect. It may be true, as will seem to be the case from what follows, that Ahau was more usually selected as an initial date than any other day, is, in fact, the initial day in most of the inscriptions and is also prominent in the Dresden codex, because, perhaps, some great event took place or was supposed to have taken place on a day Ahau. But it can be demonstrated that the initial day of some of the series in the Dresden codex where the 360-day period is one of the counters is Kan, which, in these, is necessarily the beginning of the ahau count. It is true, however, that the ahau or 360-day period must, if the succession be continuous and unbroken, begin on

the same day, a fact to which I have heretofore called attention (see The Maya Year, pages 47 and 53). But the series may be arbitrary; that is, the engraver or painter may have chosen to begin one series with one day and another with another day. This, however, goes to the very root of the subject, as Mr Goodman's system absolutely requires that the ahaus or 360-day counts shall all begin with the same day, and as worked out by him with a day Ahau. Dr Seler, impressed by the result of Dr Förstemann's investigations, has been led to believe that most of the series of the Dresden codex have 4 Ahau 8 Cumhu as their initial date, or the day to which they refer. While I admit that this is undoubtedly the day which seems to be most prominent in this codex, my investigations do not lead me to indorse his conclusion.

Now, it is true that the series on plates 46–50 of the Dresden codex, of which there are in reality 39 sectional, or 3 complete, have Ahau as the initial day, but the initial days of the three series are not all 360 days or an even multiple of 360 days apart, as they should be if Mr Goodman's theory be correct. But the series are all exact multiples of 260, showing that they are based on a 260-day period.

The long series on plates 51–58 does not commence with the day Ahau, whether we consider the upper line or lower line of days the proper one to count back from. It is also apparent that in this case the series is based primarily on the 260-day period. As the least common multiple of 260 and 360 is 4,680, it does not appear possible to bring those series based on the 260-day period into harmony with the Goodman theory except where the total number of days is a multiple of 4,680, unless we suppose that there are two series of non-coincident factors running through them. It is true that we may use the week of our calendar in counting 100-day periods by allowing for the supplementary days, as is undoubtedly done in some of the series of the codices and inscriptions; but the theory that the ahaus are time periods which can not overlap (thus indicating two starting points not consistent with the idea of uniform unbroken succession) is the point aimed at in the above references to the series of the Dresden codex. Another point in connection with the series on plates 51–58 difficult to account for on this theory is that the first day of the chuens (supposing the numbers in the lower order of units to represent the day of the chuen) is Muluc throughout. It is true that the number in the lower order of units may commence anywhere in the chuen, but if these are fixed time periods and the chuens (but not true months) as well as the ahaus commence with Ahau it seems that such important series as this one would reveal this fact somewhere in the reckoning. In the inscription at the end there are two symbols of the usual type, one indicating 1 katun, the other 13 ahaus=11,880 days, while the sum of the series is 11,960, or 80 days more.

The series on plates 71–73 has, if we may judge by the numbers

in the lower order of units, Ben as the first day of the chuens, and 5 Eb as the first day of the series. While these examples do not furnish positive proof in regard to the question at issue, they at least, in connection with what has been presented concerning the plan and object of these reckonings, do indicate that the so-called time periods are merely orders of units and not chronologic periods always coming in regular order from a fixed point in time.[1] Nevertheless, it must be admitted that most of the initial series in the inscriptions, as will clearly appear when their reckoning is presented, begin with Ahau, which fact must receive a satisfactory explanation before this question can be considered settled.

Another fact to be borne in mind is that according to Mr Goodman's idea, if a katun begins with Ahau, all the chuens or 20-day periods must commence with the same day, though not the same day number, and this would continue indefinitely. The same thing, however, would be true in this scheme were any other day selected as the initial date; all that will apply in any respect to Ahau will, until the year count comes into play, apply in every particular to any other day, a statement which admits of positive demonstration. The only reason for preferring Ahau, if there be any, is historic, or rather mythologic, as many of the series cover too great lapses of time to be historic.

If the two ahau symbols in the inscription in the Temple of Inscriptions of Palenque, referred to above on page 774, be counters in the time series with which they are connected, they certainly occupy the katun place. As they present the true ahau form, it may be possible that they bear some relation to the name of the period for which they stand. This, however, is at best but a mere guess, and the names are of but minor importance in the discussion.

INITIAL SERIES

Taking up now the initial series of the inscriptions, I shall give the beginning day of each and briefly discuss its bearing on Goodman's theory of the Mayan time system. The list so far as noticed by this author is as follows, using his notation, but substituting naught for full count:

Palenque Inscriptions.

(*1*) *Tablet of the Cross*—53–12–19–13–4–0 to 8 Ahau 18 Tzec. This connects, by counting back, with 4 Ahau 8 Zotz, the beginning day of Goodman's fifty-third great cycle. Here the numerals prefixed to the time periods are face characters for which we must take Mr Goodman's rendering (see what has been said above on pp. 773–760).

[1] After this paper was in print I discovered the connections of the high series running up through the serpent figures on plates 61, 62, and 69. These prove beyond question that 20 cycles (or 20 units of the fifth order) are counted to the great cycle (or unit of the sixth order), and that the initial date of these is in some instances Kan. It is my intention to discuss these series in the supplemental paper mentioned above.

(*2*) *Tablet of the Sun*—54–1–18–5–3–6 to 13 Cimi 19 Ceh. This connects with 4 Ahau 8 Cumhu, the beginning day of the fifty-fourth great cycle. Here also the prefixed numerals are face characters.

(*3*) *Tablet of the Foliated Cross*—54–1–18–5–4–0 to 1 Ahau 13 Mac. This connects with 4 Ahau 8 Cumhu, first day of the fifty-fourth great cycle. Here also the prefixed numerals are face characters.

(*4*) *Temple of Inscriptions*—54–9–4–0–0–0 to 13 Ahau 18 Yax. This as given by Mr Goodman connects with 4 Ahau 8 Cumhu, but has certainly been interpreted almost wholly by pure guesswork. The glyphs are nearly obliterated, but enough remains to show that the prefixed numerals were of the ordinary form, balls and short lines (see notes below).

(*5*) *Inscribed Steps*, *House C*—55–3–18–12–15–12 to 8 Eb, 15 Pop. This, as given by Mr Goodman, connects with 4 Ahau 3 Kankin, the first day of his fifty-fifth great cycle, but he admits that the prefixed numerals, all of which are face characters and badly damaged, have been determined otherwise than by inspection.

Copan Inscriptions

(*6*) *Stela A*—54–9–14–19–8–0 to 12 Ahau 18 Cumhu. This connects with 4 Ahau 8 Cumhu, initial day of the fifty-fourth great cycle. The prefixed numerals are of the ordinary form, balls and short lines, and are quite distinct.

(*7*) *Stela B*—54–9–15–0–0–0 to 4 Ahau 13 Yax. This connects with 4 Ahau 8 Cumhu, initial day of the fifty-fourth great cycle. The prefixed numerals are of the ordinary form, balls and short lines, and are distinct.

(*8*) *Stela C*—First inscription: 55?–13–0–0–0–0 to 6 Ahau 18 Kayab. This does not connect with the first day of either of Goodman's great cycles (fifty-third, fifty-fourth, fifty-fifth). The only counter of the initial series has the prefixed numerals of the ordinary form, quite distinct.

Second inscription: 55?–13–0–0–0–0 to 15? (9?) Ahau 8 Cumhu? This makes no connection with the beginning day of either of Goodman's great cycles. The prefixed numerals to the single counter are of the ordinary form and distinct. For further notice of these series, see reference to Stela C on a preceding page and remarks below.

(*9*) *Stela D*—54–9–5–5–0–0 to 4 Ahau 13 Zotz. This connects with 4 Ahau 8 Cumhu, first day of the fifty-fourth great cycle. The prefixed numerals are in this case peculiar, being complete forms.

(*10*) *Stela F*—54–9–14–10–0–0 to 5 Ahau 3 Mac? (according to Goodman). This also connects with the first day of the fifty-fourth great cycle, using the series as given by Goodman; the series is, however, wholly made up by this author, as there is nothing in the inscription and no glyphs obliterated or otherwise to indicate it, the date following immediately after the great cycle symbol.

(*11*) *Stela I*—54–9–12–3–14–0 to 5 Ahau 8 —?, the month symbol being unusual; Mr Goodman says it should be Uo. This connects with 4 Ahau 8 Cumhu, first day of the fifty-fourth great cycle, if we adopt Mr Goodman's interpretation of the month symbol. The prefixed numerals are of the ordinary form and are very distinct.

(*12*) *Stela J*—West side: 54–9–12–12–0–0 to 1 Ahau 8 Zotz (as given by Goodman). This connects with 4 Ahau 8 Cumhu, first day of the fifty-fourth great cycle, according to the counters as here given. The prefixed numerals are of the ordinary form and are mostly distinct, but there is great uncertainty as to the order in which the glyphs are to be taken.

East side: 54–9–13–10–0–0 to no recognized date; Goodman says it should be 7 Ahau 13 Cumhu, presumably reached by counting from 4 Ahau 8 Cumhu, first day of his fifty-fourth great cycle, but in this case he has made a mistake, as the connection is with 7 Ahau 3 Cumhu. The prefixed numerals are of the ordinary form and are distinct, but the order in which the glyphs come is very doubtful (see remarks below).

(*13*) *Altar K*—54–9–12–16–7–8 to 3 Lamat 16 Yax. This connects with 4 Ahau 8 Cumhu, the first day of the fifty-fourth great cycle. The prefixed numerals are of the ordinary form, but some of the glyphs are defaced and some of the numbers do not appear to agree with those given by Goodman (see remarks below).

(*14*) *Stela M*—54–9–16–5–0–0 to 8 Ahau 8 Zotz. This connects with 4 Ahau 8 Cumhu, first day of the fifty-fourth great cycle. The prefixed numerals as given in Maudslay's drawing (the photograph is not given) are of the ordinary form and correspond with the numbers given here.

(*15*) *Stela N*—54–9–16–10–0–0 to 1 Ahau 8 Zip (Goodman says that the month numeral is wrong here and that it should be 3 Zip). This will connect 4 Ahau 8 Cumhu, first day of the fifty-fourth great cycle, with 1 Ahau 3 Zip, but not with 1 Ahau 8 Zip. The prefixed numerals are of the ordinary form, are quite distinct, and agree with those given.

(*16*) *Stela P*—54–9–9–10–0–0 to 2 Ahau 13 Pop. This connects with 4 Ahau 8 Cumhu, first day of the fifty-fourth great cycle. The prefixed numerals are unusual face characters, and the result appears to have been reached by Mr Goodman by appeal to his chronological system.

(*17*) *Altar S*—54–9–15–0–0–0 to 4 Ahau 13 Yax. This connects with 4 Ahau 8 Cumhu, the first day of the fifty-fourth great cycle, according to Mr Goodman's figures here given. However, the prefixed numerals, which are of the ordinary form and distinct in Maudslay's drawing (the photograph is not given), do not appear to agree with Goodman's figures (see remarks below).

As I do not have Maudslay's photographs and drawings of the Quirigua inscriptions I will omit them from consideration here.

Examining these different series and noting Goodman's explanations

and comments, we soon perceive that the data on which to base a decision in regard to his interpretation of these initial series are rather meager. In six of them the prefixed numerals are face characters, so that the result depends entirely on the correctness of Goodman's interpretation, in regard to which the proof is as yet entirely lacking. A more thorough examination of all the inscriptions containing face numerals, including those of Quirigua, photographs of which are not yet at hand, is necessary before this question can be decided. There are two, I believe, in which connection can be made between the terminal date of the initial series and dates which follow. But this is not positive proof of correct rendering where the series runs into high numbers, as do all the initial series. This will be understood by the statement that one, two, or more calendar rounds may be dropped out of the aggregate and yet the result will be the same if the prefixed numerals are changed to accord with this result; in other words, the same remainder in days will be left in the one case as in the other. This is possible, but it is not possible to change the time periods so as to give the same result where the sum is less than a calendar round, as one of the higher periods embraces all and more than all the given lower periods. However, we may accept his interpretation where the terminal date of the initial series connects with the date which follow. The uncertain and somewhat suspicious element in the investigation is the evidence in some cases and indication in others that Mr Goodman has obtained his series not from the characters, but from his system. In these cases it is evident that connection of the terminal date by the series with the initial date proves nothing more than the correctness of his calculation. For this reason none of these are considered as evidence of the general use of a certain initial, except where there is connection with a following date through a following series. The two or three instances in which this is the case have been specially referred to. As bearing on this point, the following facts are noted:

The initial series in the Temple of Inscription (4 in the above list) is so nearly obliterated, as appears from Maudslay's photograph, that it is impossible to determine the prefixed numerals or the terminal date. The 4 (katuns) is the only distinct number in the series. Enough of the day number, given by Goodman as 13 Ahau, remains to indicate that his rendering is wrong. There are (as is also shown in Maudslay's drawing) two short lines denoting 10, but the dots or balls are obliterated; there is, however, the little loop remaining at one end. As a rule which has no known exception, unless this be one, there are never more than two balls between these end loops, usually but one (see the quotation on this from Maudslay given above). As there would have to be three to give the 13, either Mr Goodman is wrong or the inscription is irregular. This series must therefore be excepted from those offering evidence in favor of this author's theory.

The series on the inscribed steps (5 of the list) Mr Goodman admits has been determined otherwise than by inspection, and hence it must be excluded.

Series 6 and 7 of the above list (Stelæ A and B) must be accepted as evidence, as the prefixed numerals are of the ordinary form, are distinct, and make connection with the initial date of Goodman's fifty-fourth great cycle.

The two inscriptions on Stela C (8 of above list) present one unusual feature, and one which seems to bear very strongly against Mr Goodman's theory of 13 cycles to the great cycle, in fact is almost positive evidence against it. Here, following Mr Maudslay's drawing—for his photograph is not sufficiently plain for satisfactory inspection—we notice that but one time period is given, 13 cycles, and that this is followed without any intervening glyphs by the date 6 Ahau 18 Kayab. The day symbol is a face character, but is so rendered, and seemingly correctly, by Goodman. This will not make connection with the initial date of either of the three great cycles given by him. The fact that the numeral in this case (balls and short lines) prefixed to the cycle symbol is 13 appears to stand in direct contradiction of this author's theory, as "full count" is nowhere else given in ordinary numerals or even in a face character, but always in one of the symbols for full count. We never find in ordinary numerals 20 days, 18 chuens, or 20 ahaus, etc., nor has Mr Goodman in any case rendered a face character by either of these numbers.

The other inscription on this stela is also unusual in the same respect, the numeral series consisting of only one time period—13 cycles—which is followed immediately by the date 15? Ahau 8 Cumhu. The 15 prefixed to Ahau is evidently an error. Mr Maudslay, though giving 15 in his drawing, concludes, from a subsequent examination, that it may be 9 or 5. However, it will not connect with the first day of either of Mr Goodman's great cycles, whether we use the one or the other number or any other Ahau 8 Cumhu. These two initial series taken together present another fact difficult to account for on Mr Goodman's theory. They have precisely the same counters—13 cycles—but reach different terminal dates. This could not be true if the dates are in the same great cycle, and if in different ones they would necessarily be precisely one or two great cycles apart, as Mr Goodman limits the inscriptions to the fifty-third, fifty-fourth, and fifty-fifth. In his comment on these series he virtually confesses his inability to determine the number of the great cycle by the details of the glyph.

The inscriptions on the east and west faces of Stela J are placed irregularly, in one case in three columns and transverse lines, and in the other in diagonal lines; the order, therefore, in which the glyphs are to be taken is very uncertain.

According to Maudslay's drawing of Altar K (no photograph is given), the initial series of the inscription as given by Goodman does

not appear to be correct. The drawing shows 12 or 14 cycles and not 9, unless the two short lines are to be considered as one, which can only be determined by inspecting a photograph or a cast.

The initial series of Altar S (17 of the above list) as given by Mr Goodman does not correspond throughout with that of the inscription as given in Maudslay's drawing (there is no photograph). He gives 15 katuns, whereas the inscription shows only 13, the prefixed numerals being of the ordinary form.

Although the evidence presented is not sufficient to establish Mr Goodman's theory of a distinct Mayan time system, it, together with the very frequent references in the Dresden codex to the day 4 Ahau 8 Cumhu (which always falls in the year 8 Ben), indicates that this date was considered one, perhaps the chief, initial point in the time series. Dr Förstemann has called attention to its use in this codex in his Zur Entzifferung der Mayahandschriften and in a letter to me.

Neither of the high series running up the folds of the serpent figures of plates 61 and 62 appear to begin or end with Ahau. The black series in the right serpent of plate 62 over 3 Kan 17 Uo (the 16 is an evident error) reaches back, if counted from this date with 20 cycles to the great cycle, to 12 Chicchan 8 Xul; or, counted with 13 cycles to the great cycle, it reaches 10 Chicchan 18 Pax.[1] But it is noticeable that at the bottom of the plate (62) at the right of these serpent figures and extending into plate 63 are five short series with 4 Ahau 8 Cumhu as the given date in each. The red loops here seem, as I have shown on another page, to indicate connecting series, as some of them connect with the dates immediately above.

The series in the upper left-hand portion, accompanied by loops, terminate with 4 Ahau 8 Cumhu, but go back to 9 Ix counting either or both series of the column, that with the loops and that above 9 Ix.

The series running through the middle and lower divisions of plates 72 and 73 starts with 4 Eb. The two high series at the right of the upper division of plate 52 go back to 4 Ahau 8 Cumhu.

It will be seen from this discussion that while 4 Ahau 8 Cumhu is a notable initial date, it is not the only one with which series running into years commence, and that Ahau is not the only initial day in long series. There is, however, one noticeable difference between the initial series in the inscriptions and the series in the codices; in the former the symbol of the highest or sixth order of units is a marked character which has no parallel in the latter, but it must be remembered that in the latter the distinction between the orders of units is made by the position of the ordinary counters and not by distinct symbols, as in the former.

One fact which must be borne in mind in connection with this point is that Ahau can not be the first day of a year or month in Mr Goodman's system, nor in any Mayan system. It follows, there-

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[1] See footnote on page 800.

fore, that neither of his large periods—cycle and great cycle—can begin with the first day of a year. This, however, is true of most, if not all, of the series of the Dresden codex, which goes far toward proving that Mr Goodman's supposed time periods are not really such in a true sense, but are simply time counters or orders of units; otherwise we must suppose that the Maya had two time systems coincident only at certain points, which is what Mr Goodman assumes.

Why the calendar used should be called "Archaic," as compared with that of the codices, is not altogether apparent from the inscriptions examined. As given and explained by Mr Goodman, it was as complete and perfect in all its details as that which would be designated more recent. The months, years, and 52-year periods, the method of numbering the days, and hence the 4-year series and all the peculiarities of the system, were precisely the same as those of the codices. As it is a rule in the progress of human culture to advance from the imperfect and crude to that which is more nearly perfect, that the archaic Maya calendar system might be expected to exhibit imperfections which were gradually remedied by experience. Dr Förstemann, reasoning on this very justifiable assumption, concluded (though we must admit he fails to present satisfactory evidence) that primarily their years consisted of only 360 days, and that the next step in advance was to a year of 364 days, the final correction resulting in the year of 365 days. Mr Goodman says (page 3) that the Cakchiquel time system included two different years, the calendar year consisting of 366 days, and the chronologic year of 400 days (it was 400 days). His scheme includes not only a 360-day period, but carries with it the 365-day period or true year, as this is one of his essential factors, and moreover is apparent in almost every inscription and must be admitted as a part of the chronologic system of the oldest inscribed records which have been discovered, be our theory as to their time system what it may.

IDENTITY OF SYSTEMS AND CHARACTERS OF THE DIFFERENT TRIBES

That there are found in the inscriptions on the now ruined structures of Tabasco, Chiapas, Yucatan, and Central America forms for the months and for some of the days, as well as some other peculiarities in symbols, not observed in the codices, is true. But considering what has been given by early writers concerning the names and order of the days and months among the different tribes, the agreement in the forms and order of the days and months as shown by the inscriptions is remarkable. Take the day Ahau for example; although we meet here and there a face form, yet the usual symbol at Palenque, Tikal, Menche, and Copan is the same as that found in all the codices. The same is true of Ik, Akbal, Kan, Ben, Ezanab, Imix, and some others. And each holds the same relative position throughout, which indicates

a sameness and uniformity at variance with the idea of any difference in system, or any great difference even in nomenclature.

Several of the month symbols, as Pop, Zip, Zotz, Xul, Yaxkin, Mol, Yax, Kayab, Cumhu, and in fact nearly all, are substantially the same as those found in the Dresden codex, which is the only codex in which the months have as yet been discovered. This similarity would seem to indicate that the names among the different tribes have not always been correctly given by the early writers. In fact, the codices and inscriptions show greater uniformity in regard to the time system and time symbols than is to be inferred from the historical record. Each section introduces some glyphs not found in other sections, and there is more or less variation in the ornamentation and nonessential features, but the typical forms of the time symbols are generally essentially the same.

The evidence, when carefully examined in detail, presents some facts which seem to demonstrate the correctness of the above conclusion, and to show that the testimony of the early authorities indicates a greater difference in systems than is indicated by the inscriptions.

The names and order of the days of the month used by the Maya (proper), Tzental, and Quiche-Cakchiquel tribes, as based on the historic evidence, are as follows:

	Maya	Tzental	Qui.-Cak.
1	Imix	Imox	Imox
2	Ik	Igh	*Ik*
3	Akbal	*Votan*	Akbal
4	*Kan*	Ghanan	Kat
5	Chicchan	Abagh	Can
6	Cimi	Tox	Camey
7	Manik	Moxic	*Queh*
8	Lamat	*Lambat*	Canel
9	*Muluc*	Molo	Toh
10	Oc	Elab	Tzi
11	Chuen	Batz	Batz
12	Eb	Euob	*Ee*
13	Ben	*Been*	Ah
14	*Ix*	Hix	Balam
15	Men	Tziquin	Tziquin
16	Cib	Chabin	Ah mak
17	Caban	Chic	*Noh*
18	Ezanab	*Chinax*	Tihax
19	*Cauac*	Cahogh	Cooc
20	Ahau	Aghaual	Hunahpu

The names in italics are the supposed dominical days. Some of the names in these lists are but equivalents in the different tribal dialects, but this does not apply to all, as is evident from the efforts of Dr Brinton and Dr Seler to bring them into harmony.

Although uniformity in the form of the day symbols does not prove identity in the names in the different tribal dialects, it tends in this direction, if allowance be made for the variation necessary to express the same idea, and undoubtedly indicates unity of origin. Take, for example, the day Votan in the Tzental calendar, which stands in the place of Akbal in the other calendars. The symbol of this day is remarkably uniform in all the inscriptions where it appears. The same is true in regard to Kan, Lamat, and Ezanab, which never appear as face characters. As it is admitted that Votan or Uotan is not equivalent to Akbal, Kat to Kan, nor Canel to Lamat, how are we to account for the uniformity of the symbols in the several regions that these tribes are known to have inhabited?

However, the widest variation between the historic evidence and that of the inscriptions is in reference to the names of the months. In regard to these, as given historically, it may be stated that those of the Maya (proper) and the Tzental-Zotzil and Quiche-Cakchiquel groups differed throughout, morphologically and in signification, so far as the latter has been determined, no name in one being the same, save in a single instance, as that in another. As compared with those in the Maya calendar, which have already been given, those of the Tzental were 1, Tzun, 2, Batzul, 3, Sisac, etc.; those of the Quiche, 1, Tequexepual, 2, Tziba pop, 3, Zac, 4, Ch'ab, etc., differing in like manner throughout. So widely different, in fact, are they, that Dr Brinton and Dr Seler made no attempt to bring them into harmony. Now, in contrast with this, the symbols are not only comparatively uniform in the inscriptions, as is shown by the figures given in Mr Goodman's work, but, with very few exceptions, correspond with those in the Dresden codex. There are also indications that the names were the same as those found in the Maya calendar. For example, the symbol of the month Pop is characterized by an interlacing figure apparently intended to denote matting; in Maya, Pop signifies "mat." The name of the fourth month, Zotz, signifies "a bat," and the symbol, which is always a face form, has an extension upward from the tip of the nose, presumably to indicate the leaf-nosed bat. But as conclusive evidence on this point, if Mr Goodman is correct in his interpretation, the month is designated on one of the Stelae at Copan by the full form of a leaf-nosed bat. So general is the uniformity of the month glyphs, both in the Dresden codex and in the inscriptions that Mr Goodman has not hesitated to apply to all the names of the Maya calendar, and to place side by side those of the inscriptions and those of the codex. "There is not," he says, "an instance of

diversity in all their calendars; their dates are all correlative, and in most of the records parallel each other." Of course there are sporadic variations and imperfect glyphs which often render determination by simple inspection uncertain, but it is generally aided by the connecting numeral series.

The change of day symbols from the typical form to face characters is found in the codices as well as in the inscriptions, as is shown by an examination of the Troano codex, where it is of frequent occurrence. The occasional variations of the symbols for the days Chicchan, Cimi, and Ix, in the latter codex, are so radical that identity is ascertained only by means of the positions they occupy in series. It is upon this uniformity Mr Goodman chiefly bases his theory of an archaic calendar. Following the quotation given in the preceding paragraph he says (pp. 145–146):

From this is deducible the important fact that—whether a single empire, a federation, or separate nations—they were a homogeneous people, constituting the grandest native civilization in the Western Hemisphere of which there is any record. Yet when the Spaniards arrived upon this theater of prehistoric American grandeur, there was not only no powerful nation extant but no tradition or memory of former national greatness. The very sites of the ancient capitals were unmentioned, nameless, unknown. This obliviousness could not result from the passage of a few score or a few hundred years. It could only come in the wake of a period that had outlasted the patience and retentiveness of even aboriginal minds. Next, Dr Otto Stoll, the distinguished comparative linguist, who has made a special study of the Maya dialects, states that the Cakchiquel language, one of the most nearly affined to that of the Tzentals, who at present occupy the central seat of the extinct empire, is yet different enough to require a period of at least two thousand years to account for the divarication. This points to a remote date of separation, though indefinite. Thirdly, we find in the Yucatec chronicles a definite indication singularly in keeping with Dr Stoll's estimate. All the Xiu chronicles begin with a record of the migration of their ancestors, in two great bodies, about two hundred and forty years apart, from some region to the westward.

From long and careful study of the annals I have come to the conclusion that these migrations took place respectively about 353 and 113 years before the beginning of our era. That this migration could have come from the Archaic nation only is proved by the identity of the graphic system of the Yucatecs with that of Palenque, Copan, Quirigua, and other cities of the central region—a system found nowhere to the north, south, or west of it. Even to this day the Yucatec language is more closely allied to that of the Tzentals and Zotzils of that same region than to any of the other numerous Maya dialects. That the Yucatec calendar and chronological system differ in several respects from those of the Archaic cities is not a final or even grave objection to this theory, but only what under the circumstances might be expected. The Xius found the Cocoms and Itzas, older offshoots of the Maya race, already in possession of Yucatan, and appear always to have acted a subordinate part to them in subsequent history. It is not unlikely, therefore, that they changed their methods of computing time so as to conform to those of their superiors; or the change may have been made for some reason not evident to us; but that they did change their methods there can be no doubt, and that, too, shortly after their contact with the other nations. Two of their chronicles distinctly state that at a time equivalent to about the 257th year of our era "Pop was put in order." The statement can refer

only to a rearrangement of their calendars, for the calendars themselves had been in existence for unknown centuries; hence, these records probably denote the time at which they changed their chronological methods to conform to those of their neighbors. Our best hope of correlating the calendars lies in the discovery of some record made by the Xius in their new home previous to this change.

The difficulty in this theory lies in the fact that precisely the same calendar system continued down to the coming of the Spaniards, at least in some of the districts. This is proved by the codices, some of which we know were in use down to that time, though possibly understood only by the priests, and the radical differences in the month names seems to have been of comparatively recent date. The same general system, allowance being made for differences in names and forms of symbols, was also found, as has already been mentioned, among the Aztec, Zapotec, and some other stocks. In fact, except for the differences in the names of the months and of some of the days, the change of dominical days by the people among whom the Troano codex was written, and some difference in counting the months which seems to have obtained among some of the Cakchiquel, the calendar system was uniform among the Mayan tribes from the first notice we have of it to the coming of the Spaniards. The idea, therefore, advanced by Mr Goodman of an "Archaic calendar," which ceased to be in use about the time of the Xiu migration, between sixteen hundred and two thousand years ago, appears to be without valid basis.

Finally, on this point I think I will be justified in the statement that if the archaic Mayan chronologic system was so complete and perfect as it is believed by Mr Goodman to have been, it was the most systematic, orderly, and complete time system ever known to the world, not only outranking in this respect the oriental systems, but even those of modern civilization. We are therefore compelled from our examination of the subject, while commending as exceedingly valuable his real discoveries, which have been noticed, to reject his theory in regard to the ancient Mayan chronologic system, so far as it differs from that generally received, believing that he has mistaken the notation used by this ancient people in counting time for a veritable time system.

One somewhat startling result of Mr Goodman's theory in regard to the Mayan time system is the conclusion reached by him in reference to the range of time over which the history of the Maya people has extended. This is shown in the following extract from his work:

Let us, finally, consider for a moment the possibilities of duration for that Maya empire. The Mayas were a primitive, pure-blooded, united people. No ancestral prejudices or racial jealousies could spring between them. Whatever tendencies there were dependent on the inscrutable laws of nature must all have been in common. They were strong in numbers, and stronger still by their great and solitary enlightenment. They occupied a territory that is practically a fortress. To the east, south, and west there is not area enough to harbor savage foes in numbers that would have been formidable even if coalesced, and to the north, if necessary, they could oppose their united forces. No other great nation ever occupied so secure a position. Hence

the question of danger from outside sources is practically eliminated from the problem of their national existence. Their unity of origin, the simple numeral worship indicated by their monuments, the civic spirit to be inferred from the absence of all warlike insignia in the inscriptions, point unmistakably to a happy, contented, peaceful state of internal affairs, akin to brotherhood. Under such conditions, how long might not a nation endure? We go back ten thousand years and find them then civilized. What other tens of thousand years may it have taken them to reach that stage? From the time of the abrupt termination of their inscriptions, when all suddenly becomes a blank, back to that remote first date, the apparent gradations in the growth of their civilization are so gradual as to foreshadow a necessity for their 280,800 recorded years to reach the point of its commencement. Manifestly, we shall have to let out the strap that confines our notion of history. The field of native nationality in America promises, when fully explored, to reveal dates so remote that it will require a wider mental range to realize them (page 149).

This conclusion is reached by the following process of reasoning: That the concluding date (he always calls it "initial date") of the initial series "could have but a single purpose—that of recording the date at which the monument was erected." The fact that some of the stelæ have different "initial dates" on opposite sides is explained by the statement that "in these instances one date is reckoned from the other, the latter one undoubtedly designating the time of dedication." This, however, is a supposition not sustained by satisfactory evidence. As to the two on Stela C, he confesses he can give no explanation of them without radical changes in each.

By a comparison of the dates in the various inscriptions he arrives at the conclusion that the lapse of time between the earliest and latest of these was 8,383 years. Adding to this 2,348 years, the time preceding 1895 A. D., at which he thinks the record closed (page 148), "we shall arrive at the time when that ancient Maya conqueror trod his enemies under foot, 10,731 years ago, the oldest historical date in the world"; that is to say, the monument on which the earliest date is recorded was erected 8,836 years before the Christian era. To obtain the enormous stretch of 280,800 years, mentioned in the above extract, he counts back according to his theoretic time system to the beginning of the grand era. Of course, such startling result, based upon the kind of testimony offered, can hardly be accepted as historic. The inscriptions showing what may be called "initial series" exist; they show the counters up to the sixth order of units, or the great cycle, but all else upon which his great structure is built consists of speculation. There is no basis for his grand era, his 73 great cycles, or his fifty-third, fifty-fourth, and fifty-fifth great cycles. That the great cycles were numbered, just as we number thousands and millions, is undoubtedly true, but 14 is the highest numbering of which we have any positive evidence in the inscriptions or codices, which indicates that the count would have ended at 20, following the vigesimal system if carried higher.

Notwithstanding these criticisms Mr Goodman seems to be right in

his conclusion that, at the time the inscriptions were chiseled and the codices formed, the Maya people were in a much more homogeneous state and tribal distinctions much less marked than when described by the early Spanish writers. Dr Brinton says that "in all the Mayan dialects the names [of the days] belonged already at the time of the conquest to an archaic form of speech, indicating that they were derived from some common ancient stock, not one from the other, and that, with one or two possible exceptions, they belong to the stock and are not borrowed words." Though we can not say positively to what tribes the inscriptions of the different districts are to be respectively attributed, we can safely assert that they are Mayan, and that those at Palenque are in what is or was the country of the Tzental and Chol tribes; those at Menche (or Lorillard City) in the Lacandon country; those at Copan and Quirigua in the habitat of the Quiche and Cakchiquel or possibly Chol peoples; and those at Tikal in that formerly occupied by the Itza tribes. The great similarity in the time and numeral symbols and the time systems shown by the inscriptions in these different localities would seem, therefore, to justify Mr Goodman's assertion "that—whether a single empire, a federation, or separate nations—they were a homogeneous people," and thus, though these records have so far failed to furnish any direct historic data and seem likely to fail to furnish any by further investigation, they do form indirectly a firm basis in our attempts to trace the past history of this people. The next step is to determine the age of the records, for, as appears from what has been shown, the history as derived from the early Spanish writers can not be fully relied on, and the traditions can be trusted only so far as they agree with the monuments and the linguistic evidence. That Mr Goodman's conclusion in reference to their age can not be accepted is evident from the quotation given above.

One conclusion which appears to be justified by the foregoing facts is that the Maya of Yucatan represent the original stock, or that they have retained with least change of any of the tribes the names and time system of the calendar, except as to the dominical days.

NUMERAL SYMBOLS IN THE CODICES

Before closing this paper I will, for the benefit of those who have recently taken up the study of the Maya manuscripts and inscriptions, refer to some symbols found in the codices which probably represent numbers. The study of these may, if followed up by further investigation in the light of Mr Goodman's discoveries, lead to fruitful results in attempts at interpretation of the codices.

In the Dresden Codex

The katun symbol in the ordinary form shown at *a*, figure 10, is very frequently used in this codex, sometimes, as already shown, as one of the counters in a numeral series connecting dates, as for

example, on plates 61 and 69. These, which have been heretofore alluded to, are precisely of the form found in the inscriptions. The series as given on plate 69 is 15 katuns, 9 ahaus, 4 chuens, 4 days, the days having a special symbol not joined to that of the chuens. The preceding date is 4 Ahau 8 Cumhu, and that which follows 9 Kan 12 Kayab. The reckoning in this case reaches, as has been shown, the day and day number (9 Kan), but the 7th day of Cumhu instead of the 12th of Kayab. Nevertheless, there can be no question that this is a series precisely after the form of those given in the inscriptions.

In these two series are also seen the ahau and chuen symbols of the usual forms, the days, as has been stated, usually having a separate symbol, generally the so-called kin symbol, as the lower character in the symbol of the month Yaxkin.

The ordinary numerals found at the side or top of these symbols are frequently replaced by one or more little ball or cup-shape characters, such as are shown in figure 21. Others of like form attached to other period symbols are shown at A3, B3, and A4, figure 16. In the latter, ordinary numerals are also present. The first (figure 21) is from the upper division of plate 73, and the others are from plate 69. Are these characters numerals? If so, what is the value of each? As they can not together represent in any instance more than 20, and as many as three are found in some instances attached to one symbol, it is evident that, if they are number characters, each must indicate 1, 2, 3, 4, 5, or 6, not more. As the latter three have also ordinary numerals attached, but odd numbers, it may be inferred that the value is 2, 4, or 6. There is, however, other evidence bearing on this question, which is seen in the symbol shown at A3, figure 16. This is certainly the equivalent of the "calendar round" symbol of the inscriptions, and as the largest number of full calendar rounds in the time series immediately below is 5, the value of each of these little characters would seem to be 2. As a chuen symbol in the same connection is followed by the symbol for day in the abstract sense, each having these little characters attached, the evidence in favor of the theory that they are numerals is very strong. In the middle of the lower half of plate 70 a katun symbol is followed by an ahau symbol, each having these little characters attached without other numerals. So far, however, I have been unable to connect dates by means of these counters, if they be such; but this is not decisive, as there are not sufficient recognized data in any case for a fair test.

FIG. 21—Glyph from plate 73, Dresden codex.

On plate 71, second column, near the top, is a face glyph used as an ahau symbol; as positive proof that it is such, it has inserted in it a small ahau symbol of the usual type. There are several other characters in this codex which appear to be used as number symbols,

as the bird head with 10 prefixed, center of plate 70; the Imix-like character with 19 prefixed, lower left-hand corner of plate 71.

In regard to this character, which is contained in two groups—one on plate 51, shown at A5, plate XLIV, the other on plate 52, shown at C4, plate XLIV, as given in the codex, Mr Goodman's figures containing supposed restorations—he remarks as follows (p. 93):

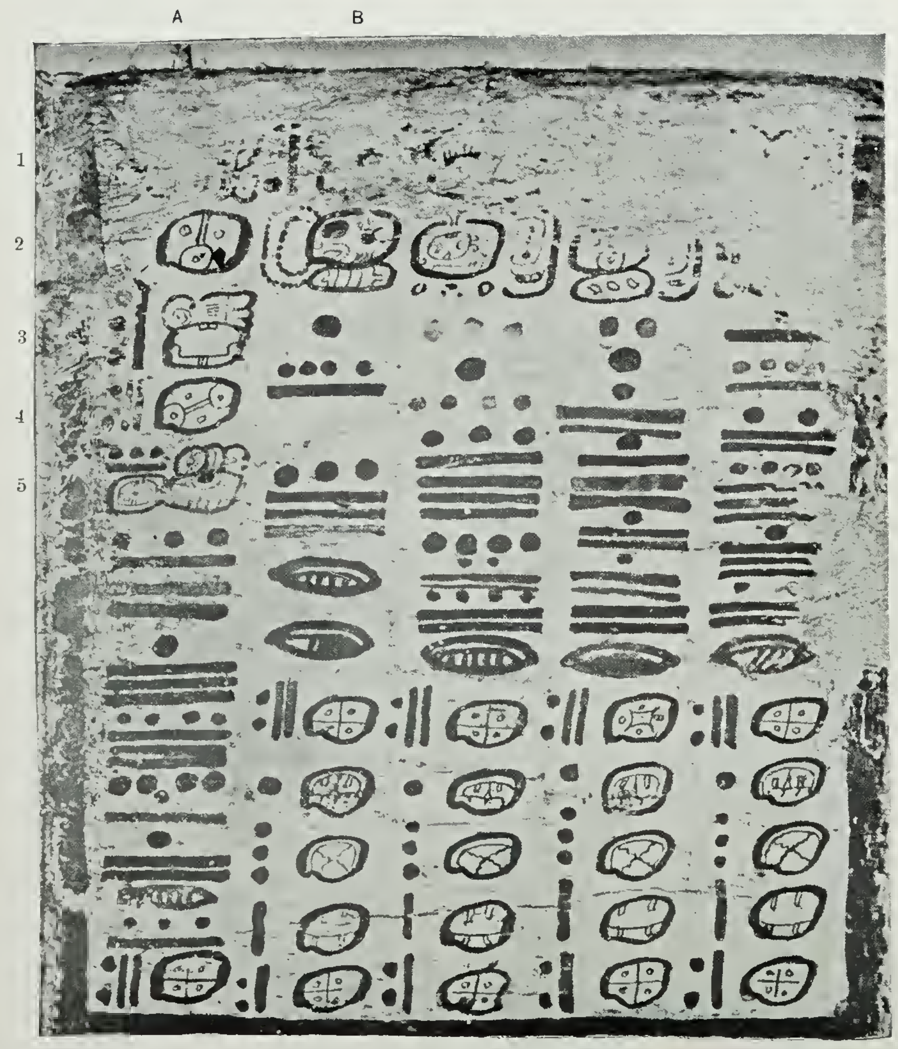
The resemblance between the last glyph in the list and the character occurring on plates 51 and 52 of the Dresden codex removes all doubt of the latter being a directive sign. It is employed so curiously in one instance that it is well worth while giving both examples of its use in order to illustrate the peculiarity. The reckonings it follows are from 4 Ahau 8 Cumhu (which, coincidently, is the beginning of the 54th great cycle of the Archaic era) to 12 Lamat in both cases, but with different intervals. The reading on plate LI is this: [See plate XLIV*a*].

Here the meaning, plainly enough, is: From 4 Ahau 8 Cumhu to the 12 Lamat; that is, 8 days from the former (or initial) date. The reading on plate 52 is more complicated. There are two 4 Ahau–8 Cumhu dates followed by this reckoning: [See plate XLIV*b*].

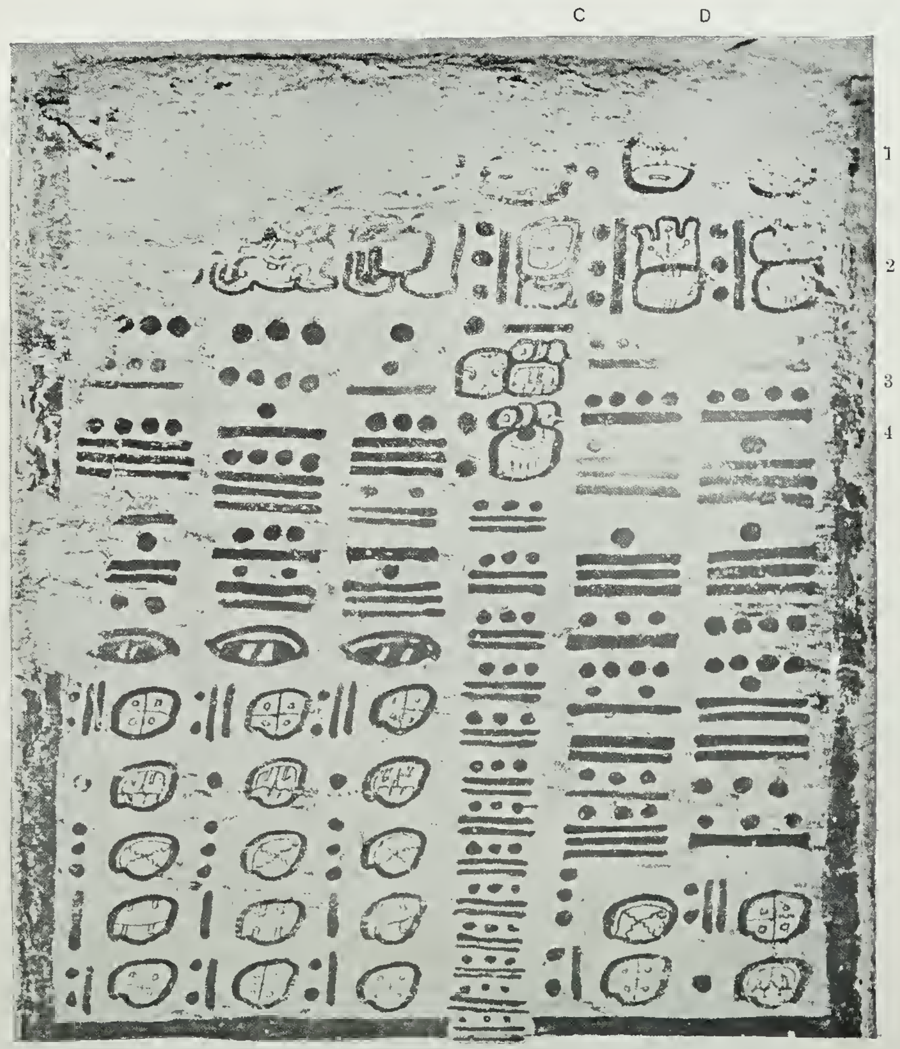
The 12 Lamat is not distinct, as here, but there can be no question of its identity, the reckoning being of exactly the same character as the other. The reading here is: 4 Ahau 8 Cumhu, 4 Ahau 8 Cumhu, to the 12 Lamat; that is, 8 days, 1 chuen, and 5 ahaus from the 2 former (or initial) dates. The peculiarity here is that the directive sign indicates the reckoning to be from two dates—the only instance of the kind that has come under my observation.

In regard to the group on plate 51 (our plate XLIV) it may be safely assumed that the upper date is 4 Ahau 8 Cumhu, and it is true that counting 8 days from this date brings the reckoning to 12 Lamat, but the long series immediately below seems to be intended to connect the latter date with the 12 Lamat which is below this long series precisely as in the preceding case, the series here ascending to the left. The assumption, therefore, that the Imix symbol is a directive sign is very doubtful; moreover, the Lamat symbol precedes it. Förstemann suggests that it signifies an ahau-katun=8,760 days.

Mr Goodman's interpretation of the group on plate 52 (our plate XLIV), will scarcely stand the test of careful examination. In the first place, the assumption that 12 Lamat stands at the head of the group is not warranted. The remnant of the obliterated glyph gives no color to it, nor is there anything in the arrangement of the series in the division to suggest it. Moreover, the two dates—each 4 Ahau 8 Cumhu—do not pertain to the column, but to the two long series at the right immediately under them. This is evident from inspection, but positive proof is found in the fact that, if we use the black numerals of the series, the 4 Ahau 8 Cumhu over the right column connects with the 12 Lamat below, and when we use the red counters we reach, in the same series, the 1 Akbal below. Using the red counters in the left column and counting from the 4 Ahau 8 Cumhu above, we reach 7 Lamat below. The black numerals of this column, which, as they stand, differ only 10 days from those of the right column, reach Ezanab,



A



B

UPPER DIVISION OF PLATES 51 (*A*) AND 52 (*B*), DRESDEN CODEX

but the day number is 9 and not 3, as it should be; a dot over the 10 chuens will, however, make the connection. It is evident, therefore, that Mr Goodman's explanation of the two dots before the Imix-like symbol of the group is only a supposition, and his theory as to the use of this symbol is without convincing support; nevertheless, it is probably a numeral character. Förstemann's suggestion is that it signifies a "katunic cycle," Goodman's calendar round.

It is true that the troublesome question arises, Are we to assume that the glyphs which have been noticed are always to be considered number symbols, wherever found? This would appear to carry the idea of number symbols to the extreme. See, for example, the ahau symbols on plates 72 and 73. To assume this would imply that the various prefixes to these symbols are numeral signs, as Mr Goodman contends, having assigned values to most of the types found on the plates referred to. Possibly he may be right (see page 67 of his work).

Fig. 22 — Figures from plate 72, Dresden codex.

A puzzling character found in this codex is the red circle or loop with bowknot on top (figure 22). Whether these are intended as symbols of connection or not, the series connected with them appear in a majority of cases to form links between other series or to join one or more of what we may term side dates not following in the line of the series. They appear, however, in one series to have some other use; at least, as will be seen when the series is noticed, the numerals inclosed appear to be used in a different way from those in other loops.

The first we notice are those in the lower left-hand corner of plate 70. Counters connected with the left loop are 4 (supposed) chuens, 6 days, the latter number being inclosed in the loop. The date below is 4 Ahau 8 Cumhu, and at the top of the long series over the loop is 9 Ix. If we count backward from 4 Ahau 8 Cumhu 4 chuens, 6 days, or 86 days (which does not carry us beyond the commencement of the year), we reach 9 Ix. The numerals connected with the right loop are 10 chuens, 8 days, or 208 days, the date below 4 Ahau 8 Cumhu and the day above 4 Eb. Reckoning backward as before, we reach the 4 Eb above. The rule also holds good for the counters connected with the loops above, near the middle of the same plate, where those of the left loop are 1 ahau, 12 chuens, 6 days, and those of the right 4 ahaus, 10 chuens, 6 days, the date below each being 4 Ahau 8 Cumhu and the day above each 9 Ix.

The reckoning indicated by the series belonging to the loops in the lower left-hand corner of plate 63 is not quite so satisfactory. The series of the left loop is 11 chuens, 15 days, the date above 3 Chicchan 13 Kankin; that of the middle loop 17 days, the date above 13

Akbal 6 Cumhu; that of the right loop 7 (or 2) ahaus, 14 (or 2) chuens, 19 days, the day above 3 Chicchan (or 13 Akbal); the date below each, 4 Ahau 8 Cumhu. Counting the series of the left loop backward, we reach 3 Chicchan 13 Yaxkin. This is correct except as to the month, which in the codex is certainly Kankin. The reckoning in case of the middle loop reaches 13 Akbal 11 Kayab, whereas the month date in the original is 6 Cumhu. The series attached to the right loop has been corrected by the insertion of a red 2 between the ahau and chuen numerals. The long series above has also been corrected, which indicates some material error here. However, the series will not connect with either of the two days above, following or rejecting the correction. Attention is called to the fact that the numerals inclosed in the loops here in each case exceed 13, the highest day number, as the question of the use of the numerals will come up in a series to be noticed.

The series belonging to the red loop on plate 58 (using the original black numerals, there being a correction or different series in red) is 1 ahau, 7 chuens, 11 days; the date below 4 Ahau 8 Cumhu, the nearest date of the long series to the right is 13 Muluc —? Zac. The reckoning backward reaches 13 Muluc 2 Zac. The native correction is a red 12 inserted between the ahau and the chuens. This has probably been inserted to bring the reckoning to the Muluc of the right column above the lower date. The series in the upper division connects with 13 Oc to the right. That in the middle division of plate 43 connects with the 3 Lamat over it. Of the two series in the upper division of plate 31, that of the right loop connects with the date above, but that of the left does not. The series attached to the red loop on plate 24, if we consider the red symbol inside as naught, connects with 1 Ahau 18 Kayab at the right.

The series connected with the thirteeen loops, upper divisions of plates 71–73, appears to be the usual form of most other series of the codex, but in this case the numbers in the loops do not form part of the counters, but denote the day numbers of the days reached, counting forward (from left to right) from 9 Ix (plate 71), with an interval of 2 chuens, 14 days. This series is explained in my Aids to the Study of the Maya Codices (Sixth Ann. Rep. Bur. Eth., pp. 337–338). It may, however, be called a connecting series, as by the numbers in the loops—though they are day numbers and never exceed 13—it is joined to the series concluding in the upper division of plate 71.

It will be observed that in each case except the last the day from which the reckoning is made is 4 Ahau, and when the month is given 4 Ahau 8 Cumhu. It would seem, therefore, that special importance was, for some reason, attached to this date by the people of the country and era when the codex was written. This, it must be admitted, bears somewhat in favor of Dr Seler's and Mr Goodman's idea of the importance of Ahau in the Mayan time count.

In Other Codices

In regard to these it may be stated in brief that in the Cortesian codex plates 31 to 38 contain frequent repetitions of the ahau symbol, used apparently as a counter, ordinary numerals being generally attached. These, however have, in addition to the numerals, other appendages not seen in the inscriptions (at least not in the same form) as, for example, the cross-hatched adjunct seen on plate 34. It is true some of the forms given by Goodman show cross-hatching, and of these the Cortesian character may be an equivalent. On plate 34 in the lower division and elsewhere are symbols (with numerals attached) which apparently occupy the place of days and chuens, or of the first and second orders of units. However, I am unable to determine either their relation to any of the numerous dates on the plate or their use. Mr Goodman gives to the cross-hatching in some instances the value of 9, but in others he uses it as a multiplier, usually as 20×20 (see pp. 100, 101 of his work). Possibly he would decide that these ahau symbols are simply intended to refer to the beginning of the first, third, tenth ahau, etc., according to the number prefixed. I am inclined to believe there can be little doubt that they are counters with the usual value assigned to the ahau, whatever may be their relation to the dates on the plate.

On plate 35, lower division, and possibly elsewhere, is what appears to be a counter in which the chief element is the Cauac character. The ordinary chuen symbol occurs quite frequently on the plates referred to, but never with more than one set of numerals. Other symbols with numerals attached which may possibly be counters are found on the same plates, but I have been unable to test the supposition.

In the Troano codex what appear to be ahau symbols are found on plates 20 to 23, 31, 7* to 10*, and also elsewhere. On the latter two plates are also what appear to be katun symbols. In a few instances these two symbols have numerals attached. Scattered through the codex are quite a number of other symbols with numerals attached, which appear to be counters or number glyphs. On the so-called title-page of this and the Cortesian codices are quite a number of glyphs which I take to be number symbols. Some of these I presume from the form to be chuens, but they are in groups usually with numerals attached, and as in three instances these numerals are 19, I take them to indicate days, and the number of chuen symbols in a group to indicate the number of chuens, as the two numbers attached to the chuen glyphs in the inscriptions indicate the days and chuens. I am also rather inclined to the belief that on this title-page the fourth line of characters from the top denotes ahaus. The red oval symbols below with numerals attached are also probably number glyphs,

but they must indicate days or some higher order of units than chuens, as the numerals in some cases are 19. However, I have not succeeded in finding any relation between these series and accompanying days.

Whether I have succeeded in showing satisfactorily the real discoveries made by Mr Goodman and in indicating clearly their true value must be determined by the use which other workers in this field will make of what has been here presented. That these discoveries have opened up new lines of investigation in regard to the signification of the codices and inscriptions will be admitted. Believing that the advance made thereby may be profitably carried into the study of the codices in connection with Dr Förstemann's discoveries, I have added some suggestions in regard thereto in the hope that other workers in this field may be induced to pursue the subject.

WORKING TABLES.

As an aid to readers I have followed Mr Goodman's example in presenting tables, chiefly after those in his paper, carrying the cycles up to twenty.

Calendar rounds				Calendar rounds			
1	18,980	21	398,580	41	778,180	61	1,157,780
2	37,960	22	417,560	42	797,160	62	1,176,760
3	56,940	23	436,540	43	816,140	63	1,195,740
4	75,920	24	455,520	44	835,120	64	1,214,720
5	94,900	25	474,500	45	854,100	65	1,233,700
6	113,880	26	493,480	46	873,080	66	1,252,680
7	132,860	27	512,460	47	892,060	67	1,271,660
8	151,840	28	531,440	48	911,040	68	1,290,640
9	170,820	29	550,420	49	930,020	69	1,309,620
10	189,800	30	569,400	50	949,000	70	1,328,600
11	208,780	31	588,380	51	967,980	71	1,347,580
12	227,760	32	607,360	52	986,960	72	1,366,560
13	246,740	33	626,340	53	1,005,940	73	1,385,540
14	265,720	34	645,320	54	1,024,920	74	1,404,520
15	284,700	35	664,300	55	1,043,900	75	1,423,500
16	303,680	36	683,280	56	1,062,880	76	1,442,480
17	322,660	37	702,260	57	1,081,860	77	1,461,460
18	341,640	38	721,240	58	1,100,840	78	1,480,440
19	360,620	39	740,220	59	1,119,820	79	1,499,420
20	379,600	40	759,200	60	1,138,800	80	1,518,400

Ahaus		Katuns		Cycles	
1	360	1	7, 200	1	144, 000
2	720	2	14, 400	2	288, 000
3	1, 080	3	21, 600	3	432, 000
4	1, 440	4	28, 800	4	576, 000
5	1, 800	5	36, 000	5	720, 000
6	2, 160	6	43, 200	6	864, 000
7	2, 520	7	50, 400	7	1, 008, 000
8	2, 880	8	57, 600	8	1, 152, 000
9	3, 240	9	64, 800	9	1, 296, 000
10	3, 600	10	72, 000	10	1, 440, 000
11	3, 960	11	79, 200	11	1, 584, 000
12	4, 320	12	86, 400	12	1, 728, 000
13	4, 680	13	93, 600	13	1, 872, 000
14	5, 040	14	100, 800	14	2, 016, 000
15	5, 400	15	108, 000	15	2, 160, 000
16	5, 760	16	115, 200	16	2, 304, 000
17	6, 120	17	122, 400	17	2, 448, 000
18	6, 480	18	129, 600	18	2, 592, 000
19	6, 840	19	136, 800	19	2, 736, 000
20	7, 200	20	144, 000	20	2, 880, 000

PRIMITIVE NUMBERS

BY

W J McGEE

CONTENTS

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PLACE OF NUMBERS IN THE GROWTH OF KNOWLEDGE

The gateway to knowledge of aboriginal character is found in aboriginal conduct; for among primitive folk, habits of action are more trenchant than systems of thought. Yet full knowledge of aboriginal character may be gained only through study of both the activital habits and the intellectual systems of the aborigines; for in every stage of human development, action and thought are concomitant and complementary.

In dealing with aboriginal customs connected with numbers (simple counting, numeration, calendar systems, etc.), the working ethnologist is confronted by the elusive yet ever-present fact that primitive folk commonly see in numbers qualities or potencies not customarily recognized by peoples of more advanced culture. Accordingly it seems especially desirable to trace the thoughts, as well as the customs, of primitive number-users, and this may be done with a fair degree of confidence in the light of homologies with the early stages of mathematics and related knowledge among peoples of advanced culture.

Fairly close homologies with the numbers of primitive peoples are afforded by the early stages of chemistry and astronomy. Chemistry grew slowly out of alchemy as natural experience waxed and primeval mysticism waned; and in earlier time astronomy grew out of astrology in similar fashion. The growth of chemistry is fairly written, and that of astronomy less fully recorded in early literature; and in the history of both sciences the records are corroborated and the sequence established by vestigial features—for such features are no less useful in defining mental development than are vestigial organs and functions in outlining vital evolution.

Now on scanning the long way over which modern knowledge came up, it becomes clear that the beginning of chemistry marked the third step in the development of science, and that the beginning of astronomy marked an earlier step; and it also becomes clear that another

step, taken amid the mists of unwritten antiquity, was marked by the beginning of mathematics. In the absence of records, the rise of mathematics may be traced partly (like the growth of the next younger sciences) by vestigial features and functions; and these vestiges indicate that, just as scientific chemistry came out of mystical alchemy and as scientific astronomy sprang from mystical astrology, so rational mathematics grew out of a mystical system which long dominated the minds of men and slowly waned under the light of natural experience concentrated among the Arabs of past millenniums. In Arabia this mystical system preceded the simple and essentially natural, though happily conventional, system of enumeration and notation long known as algorithm (or algorism)—i. e., that inchoate form of arithmetic which permitted numerical treatment of quantities, and thus gave a foundation for science. The mystical system is even more clearly represented in algebra, in which the conventional symbols now used to express natural values were originally employed as indices of magical potencies, like the characters inscribed on amulets and talismans; indeed the literature of science yields definite records of that long-abandoned side of algebra known as almacabala (sometimes written almachabel) from the Arabic word for learning and the Hebraic (or older) term for mystical or magical attainment of purpose,[1] the whole constituting a jumble of occult or semi-occult redintegration such as appeals strongly to the ill-developed mind. Accordingly the stepping stones to modern science may be enumerated as (1) almacabala, (2) astrology, (3) alchemy, leading respectively to mathematics and astronomy and chemistry, the oldest branches of definite knowledge.

While the transition from almacabala to mathematics is indicated somewhat vaguely by the records and more clearly by vestiges among the peoples influenced by Arabic culture (including all the Aryans and their associates, who make up the intellectual world), the sequence is established by parallel developments displayed by other lines of culture. The import of these parallelisms becomes clear in the light of principles pertaining both to science in general and to anthropology in particular; and some of these principles are worthy of enumeration:

1. In all science it is necessarily (albeit often implicitly) postulated that knowledge grows by successive increments through experience and its assimilation, through observation and comparison (or generalization), through discovery and invention, or, in short, through natural processes. In the natural (or chiefly inductive) sciences and in recent decades this postulate is commonly made consciously and deliberately; in the more abstract (or chiefly deductive) sciences the postulate is less frequently made consciously, though a notable example of recognition

[1] "Cabala, or 'practical cabala,' as described by Hebraic authors, is the art of employing the knowledge of the hidden world in order to attain one's purpose in accordance with the mysticism expounded in the 'Sefer Yezirah' (Book of Creation), in which the creation of the world is ascribed to a combination and permutation of letters of the alphabet."—The Jewish Encyclopedia, Vol. I, 1891, p. 548.

of the experiential basis of mathematics was recently afforded by the president of the American Mathematical Society.[1]

2. In all departments of definite knowledge, but especially in the several branches of anthropology, it is implicitly, if not explicitly, postulated that knowledge is diffused and its acquisition stimulated through association and interchange among individuals and peoples; indeed, this postulate affords the warrant, and forms the basis, for education.

3. In anthropology as in other sciences it is necessary to recognize a volume or body of knowledge proper to each people, made up of the combined intellectual possessions of all the individuals, increasing with successive experiences, decreasing only through disuse or neglect, and in greater part perpetuated by record and tradition if not by direct heritage.

4. In ethnologic research, as measurably in other lines of inquiry, it is desirable and fair to assume that (*a*) mental capacity and (*b*) the sum of knowledge, either in the individual or in the group, are in the long run practically equivalent.

5. In ethnologic inquiry it is convenient to assume that the course of development is approximately uniform (or about as nearly similar as are environmental conditions) in each separate or independent group of men. This assumption, which was recognized first by Powell under the law of activital similarities, and later by Brinton under the formula "unity of mind," is rapidly crystallizing in the minds of anthropologists; it is, indeed, but a corollary of the primary postulate on which all science rests, namely, that knowledge grows by natural means; and latterly the postulate (which is but a generalization of invariable experience), with its corollaries and applications, has been formulated as one of the cardinal principles of science, namely, the responsivity of mind.[2]

The recognition of the foregoing principles yields a means of outlining intellectual development in general, and hence of defining the grades, or growth-stages, of given intellectual stocks (or peoples); for when once the general scheme of development indicated by the several examples is perceived clearly, the relative positions of each of the examples are evident. The relations of the natural stages in intellectual development may be illustrated by comparison with the growth-stages of aged sequoia groves of prehistoric birth, whose beginnings no man recorded and no living man saw, but whose history may be read clearly in terms of younger groves in other counties; for the towering groves of the big-tree species and the upshooting forests of human ideas may well be likened in individual and collective growth, save that the vegetal species is decadent and shrunk into scattered

[1] "Even pure mathematics, though long held apart from the other sciences, must be founded, I think, in the last analysis, on observation and experiment."—R. S. Woodward, Science, new ser., vol. XIII, 1901, p. 522.

[2] Proc. Washington Academy of Sciences, vol. II, 1900, pp. 1–12.

patches, while the mental growth is luxuriant and spreading exuberantly from province to province throughout the lands of the earth. In both cases the interpretation in terms of growth-stages is established by conformity with natural law: did the grove receive extranatural impulse at any stage, or did knowledge arise otherwise than through interactions of nature, the interpretation would fail; but in the absence of evidence against the uniformity of nature, the equivalence of corresponding stages must be recognized alike for the figurative forests of ideas and the material forests of wood and leafage.

Now the acceptance of these principles, and the recognition of the general course of intellectual development, afford a means of tracing the unrecorded history of Aryan culture and of interpreting the meager records of Arabia's mathematical pioneering in terms of the culture of other peoples still below, or just rising above, the plane marked by the birth of writing—i. e., the beginning of scriptorial culture. Especially useful for comparison are various practically independent Amerind peoples, some low in prescriptorial culture, others grappling with the rudiments of definite graphic art, and still others just within that phase of scriptorial culture marked by conventional calendric and numeral systems; hardly less useful are several African peoples representing various early stages of development; of much significance, too, are the Australian tribes, of culture so low that numerical knowledge is inchoate only, together with different Polynesian tribes whose culture curiously reflects their distinctive environment; while useful suggestions as to the origin of numerical concepts may be drawn from various subhuman animals. True, the lines of mental growth maturing in mathematical systems must vary with environmental conditions, and doubtless with hereditary traits persistently reflecting both ancestral and proto-environmental factors; yet, if knowledge be not an extranatural product rather than a reflex of nature (as brilliantly conceived by Bacon) the lines must be so far conformable as to render the comparisons trustworthy and sufficiently accurate for practical purposes—just as the retracing of the history of an isolated grove by comparison with the growth-lines of other groves must be inexact in detail, though trustworthy in general and sufficiently accurate to meet practical needs.

CHARACTERISTICS OF PRIMITIVE THOUGHT

In tracing the lines of intellectual growth maturing in modern enlightenment, it is needful to note certain habits of mind characteristic of all primitive men, yet measurably distinct (in degree if not in kind) from those common to civilized and enlightened men; and for present purposes, as for practically all others, it will suffice to define primitive peoples as those who have not yet acquired and assimilated

the art of writing, i. e., as those who remain in prescriptorial culture; for the longest single step in the development of mind and the widest chasm dividing humanity is that marking the transition from the lowly stage of unaided thinking to the stage of mechanically extended memory and mentation.

Mysticism of primitive thought—All primitive men are mystics. Believers in extranatural potencies, inexpert observers, and inconstant reasoners, their vague faith veils or counterfeits realities and clothes its own figments with all manner of attributes, oftener incongruous than germane. In their simple (and presumptively primeval) aspect, the fear-born figments are grotesque shadows or fantastic duplicates of actual things moved by capricious or malicious motives, like those of human kind; in somewhat advanced thought the figments are more complex, and are incarnated chiefly in self-moving things and invested with enlarged and intensified autonomy; while in the higher stages of primitive culture the figments are idealized into mystical potencies conceived to actuate the objects and powers of the universe in accordance with impulses and motives such as those observed to control human action. And this lowly faith, with its imputation of animistic impulses and agencies to all nature, is far more than mere abstraction; in all its aspects the belief is profound and paramount; it is an ever-present possession, passing often into complete obsession, whereby action and thought are habitually and wholly controlled.

In every phase of primitive culture the mystical potencies imputed to natural things are held to be the chief factors of failure or success in the ceaseless strife for existence. So these potencies are invoked by fasting, propitiated by sacrifice, celebrated by feasting, and expatiated and glorified by individual and collective ceremony, as well as by the marvelously persistent tradition of prescriptorial culture. The first effect of recurrent ceremony is to crystallize the animistic concepts and concentrate the imputation of potency on the more conspicuous objects of current experience, and hence to lead to the deification of strong and swift beasts, venomous serpents, rapacious birds, turbulent waters, destructive volcanoes, and other impressive things; though since the successful men and tribes give more thought to joyous glorification and less to anxious propitiation than their unsuccessful contemporaries, the beneficent potencies tend to survive and the maleficent mysteries tend to die out of the darksome—but ever brightening—faith of primitive men. Yet throughout the whole domain of lowly culture the mystical potencies are dominant factors of thought.

In all aspects of primitive faith the controlling mysteries are conceived as associated with symbolic objects and actions; and by reason of this notion both mysteries and symbols are zealously enshrouded in ever deeper mysticism. So, fetishism and shamanism grow apace; not only ceremonial objects, but places and persons and forms of utter-

ance become secret or sacred, as when the plaza is forbidden to all save priests, and when the Word is deemed a symbol of the Life of the speaker. So, too, esoteric observances, impressive insignia, and imposing formalities are established, and systems of rank or caste grow up as tangible expressions of the intangible structures of controlling subjectivity. Cumulatively strengthened by reaction of symbol on mystery and of mystery again on symbol, the pervading mysticism is exalted above all other motives in primitive thought; and the artistic concepts, the industrial devices, the social relations, and the themes and forms of speech all pass under the control of the unreal potencies which shadow the primitive thinker.

Throughout primitive culture invocation habitually carries a reverse of incantation, so that the normal course of fiducial development is attended by persistent magic, sortilege, thaumaturgy; while in the higher stages necromancy and soothsaying, spells and enchantments, conjury and exorcism, oracles and ordeals, and divination by lot or chance become characteristic. In the higher strata, too, expressions supplement or supplant the objective symbols of lower plane, and the jargon of jugglers and the farrago of fakirs take the place of fetiches and idols; and it is particularly significant that words and verbal formulas come to be regarded as superpotent expressions of mystical power, and that even the letters of early times were credited with creative powers in practical cabala. Some savage tribes regard their language as sacred, some have hieratic languages, and among all known tribes personal names are considered magical or tabu in one way or another; while just within the lower strata of scriptorial sculpture (as illustrated by the Arabs and Hindoos and other Eurasians of a few centuries ago, and attested by literary and linguistic and objective vestiges), shibboleths and numerical formulas become rife, and the inscribed talisman and abracadabra and mystical number, and eventually the magic square, form favorite symbols of occult power.

The growth of writing and the attendant decadence of tradition sounded the knell of primitive mysticism; for one of the leading functions of lowly faith in the actual economy of thought was the maintenance of long series of mnemonic associations, and when this function was assumed (and better performed) by mechanical devices the strongest support of the crude philosophy fell away. Yet the mode of thought crystallized by uncounted generations of habit was too firmly fixed for easy dropping, and innumerable vestiges in the line of Aryan culture, as well as the examples afforded by other lines, demonstrate the potency of primeval mysticism and the tenacity of its hold on the human mind even beyond the verge of modern enlightenment.

Egoism of primitive thought—All primitive men are egoists. Knowing little of the external world, tribesmen erect themselves or

their groups into centers about which all other things revolve according to the caprice of their all-potent mysteries; they act and think in terms of a dominant personality, always reducible to the Ego, and an Ego drawn so large as to stand for person, place, time, mode of action, and perhaps for raison d'être—it is Self, Here, Now, Thus, and Because. Science shows that the solar system hurtles through space, presumably about an unknown center; it showed before that the sun is the center of our system; but the heliocentric system was expanded out of an antecedent geocentric system, itself the offspring of a demo-centric system, which sprang from an earlier ethnocentric system born of the primeval egocentric cosmos of inchoate thinking. In higher culture the recognized cosmos lies in the background of thought, at least among the great majority, but in primitive culture the egocentric and ethnocentric views are ever-present and always-dominant factors of both mentation and action.

The prominence of self-centred thinking in lowly life is exemplified by kinship organization, the universal basis of primitive society. In the lowest of the great culture stages, the recognized kinship is maternal, and in the next higher (but still prescriptorial) stage it is nominally paternal, though increasingly modified by adoption and other conventional devices; yet the organization is maintained by bonds and interrelations which can not better be illustrated than by analogy with the planetary assemblage: Each individual rotates independently, may be attended by satellites, and revolves primarily about the head of the family yet ultimately about the patriarch of the group, and each exerts a definite attractional influence (albeit proportional to individuality—or perhaps intellectuality—rather than mass) on all his associates. The relative social positions are expressed and kept in mind by habitual conduct and form of speech; each member of a family, each family of a clan, and each clan of a tribe has a fixed place in the group to which he or she is kept by thon's own memory and constrained by the consensus of associates; and among most primitive peoples no individual can speak to or of a companion without reference to the currently accepted view of his circumscribed cosmos—a man can not say "brother," but must say "my elder brother," or use some other term implying the relative position of several individuals to himself, and among each other as reckoned through himself; and in many tribes the terms of relationship used by women differ from those employed by men.

The ever-present view of a self-centered cosmos finds expression throughout primitive language, as well as in the lowly faith with which it is bound up and in the social organization by which it is maintained. Primitive speech is essentially associative, abounding in numbers and genders, persons and cases, moods and tenses, in a complex structure reflecting the egocentric habit of thought. This structure

is crystallized in a characteristically and often chaotically elaborate grammar, well suited to the formulation and utterance of a limited number of ideas representing a few main classes (or lines) of thought, and well adapted to maintaining the associative thought habit; so that primitive languages are essentially structural or morphologic, only incidentally lexic. With the multiplication of ideas accompanying cultural advance, the bonds of linguistic association break under their own weight, and discrete vocables multiply at the expense of unwieldy collocations; and with the attainment of writing, the function of linguistic association largely disappears, and speech becomes essentially lexic, only incidentally morphologic.

Concordantly with self-centered language, primitive arts and industries are conspicuously egoistic. The most strikingly inchoate esthetic thus far critically studied is the totemic face-paint borne by the matrons of clans, apparently as beacon-signals analogous to the face-marks of various animals,[1] while the tattoo-marks denoting marriage among the women of many Amerind tribes are clear vestiges of the more primitive beacons; and the autobiographic winter count of the warrior and the closely related calendar of the shaman are commonly egocentric, never more than ethnocentric—for if the motives of the primitive scribe perchance transcend self, they never outpass the clan or tribe, or at most the confederacy. Similarly the industrial devices of early culture are held to absorb and retain a part of the personality of, and indeed to become subjective appendages to, their makers and users; while in advancing culture the subjective personality of the device passes over into the industries in such wise as to engender guilds and crafts, and ultimately to grow into the "art and mystery" of conventional apprenticeship.

Concordantly, too, egocentric thought finds expression in primitive belief; for the individual long retains his personal tutelary or fetish, endowing it with characters revealing his own subjectivity; and it is with exceeding slowness that he rises first to the recognition of family fetishes and clan totems, and eventually to the inheritance, or perhaps as among the Kwakiutl Indians to the conjugal acquisition, of those symbols of potency, and much later that he rises to that recognition of alien tutelaries which expands with piratical and amicable acculturation, and ends in pantheism.

So in every line of human activity self-centered thinking is crystallized by custom, and the thought and custom interact with cumulative effect in dominating the primitive mind well into the upper strata of prescriptorial life. The persistence of the cumulative effect is clearly indicated by numberless vestiges of egocentric cosmology clinging often to the higher phases of Aryan culture.

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[1] Cf. The Seri Indians: Seventeenth Annual Report of the Bureau of American Ethnology, 1898, part 1, p. 168.

In short, it can not be too often stated or too strongly emphasized that primitive thought is unlike the finer product of contemporary intellectuality. While the differences are many, the most conspicuous are those connected with the pervading mysticism and prevailing egoism of primitive thinkers, both magnified in their influence by the fewness of concurrent intellectual stimuli and motives; so that prescriptorial culture may justly be regarded as the outgrowth and outshowing of that mysticism-egoism which arose early in the unwritten past, which began to decline with the birth of writing, but which still retains some hold on the minds of men.

PRIMITIVE COUNTING AND NUMBER SYSTEMS

Numeration

Simple counting is an accomplishment common to men and many lower animals. The special appreciation of numbers sometimes displayed by horses, dogs, and pigs may be due to human association, while the geometric sense of the bee may be considered mechanical merely; yet the well-known ability of the crow to count (or at least to discriminate units) up to six or seven, the similar faculty of the fox, and the habits of wasps in providing fixed numbers of spiders for their unborn progeny, as well as various other examples, demonstrate a native capacity for numerical concepts on the part of birds and mammals and insects.

Apparently similar is the numerical capacity of various lowly tribes of different continents: Numerous Australian tribes are described as counting laboriously up to two, three, four, or six, sometimes doubling two to make four or three to make six, and in other ways revealing a quasi-binary system; though both Curr and Conant opine that "no Australian in his wild state could ever count intelligently to seven."[1] Certain Brazilian tribes are also described as counting only to two, three, or four, usually with an additional term for many; while the Tasmanians counted commonly to two and sometimes to four, and were able to reach five by the addition of one to the limital number.[2]

The analogy between the counting of the tribesmen and that of the animals is not so close as the bare records suggest, since the descriptions of the tribal reckoning relate to systems of vocal numeration rather than to actual ability in discrimination and enumeration; moreover, most of the tribesmen reveal the germ of notation in the use of sticks, notches, knotted cords, and the like to make tangible the numerical values—something which lower animals never do so far as is known. Actually the savages, even those of lowliest culture,

[1] The Number Concept, by L. L. Conant, 1896, p. 27; The Australian Race, by E. M. Curr, 1886, vol. I, p. 32.

[2] The Aborigines of Tasmania, by H. Ling Roth, 1890, p. 147.

habitually think numerically up to or above three, as is shown by the plurality of plurals and by other features of their speech; and the meagerness of their numeration no more negates numerical capacity than does the absence of such systems among counting crows and foxes and wasps. Nevertheless, the comparison is instructive. In the first place, it indicates roughly corresponding ability to count on the part of higher animals and lower men; it also defines the origin of vocal numeration at the bottom of the scale of human development; and it is especially significant in demonstrating that neither the animals nor the men (1) either cognize quinary and decimal systems, or (2) use their own external organs (toes, fingers, etc.) as mechanical adjuncts to nascent notation—unless the binary numeration of certain Australian tribes is really bimanual, as W. E. Roth implies.[1] Many primitive peoples count by fingers and hands, sometimes with the addition of toes and feet, and thereby fix quinary, decimal, and vigesimal systems; but the burden of the evidence derived from animal counting and from the numeration of lower savagery seems to demonstrate that these systems are far from primeval.

Simple number systems of mystical or symbolic character abound among the better-studied tribes of middle-primitive culture, including the aborigines of North America. The most widespread of the mystical numbers is four. It finds expression in Cults of the Quarters in North America, South America, Asia, and Africa, and is suggested by certain customs in Australia;[2] it is crystallized in the swastika or fylfot and other cruciform symbols on every continent, save perhaps Australia; and it is established and perpetuated by associations with colors, with social organization, and with various customs among numerous tribes. In much of primitive culture the hold of the quatern concept is so strong as to dominate thought and action—so strong as to seem wholly inexplicable save through the interwoven mysticism and egoism of the lowly mind. The devotee of the Cult of the Quarters is unable to think or speak without habitual reference to the cardinal points; and when the quadrature is extended from space to time, as among the Papago Indians, the concept is so strong as to enthrall thought and enchain action beyond all realistic motives. To most of the devotees of the quatern concept—forming probably the majority of the middle primitive tribes of the earth—the mystical number four is sacred, perfect, and all-potent, of a perfection and potency far exceeding that of six to the Pythagoreans and of the hexagram to Paracelsus and his disciples; they are unconscious or only vaguely conscious of any other numerical concept; and many investigators fail to discover the reverse of the quartered shield and so trace the mystical figure to the subconscious self which it invariably reflects. Yet careful inquiry shows

[1] Ethnological Studies among the North-West-Central Queensland Aborigines, 1897, p. 2.
[2] Curr, The Australian Race, vol. I, pp. 339, 340.

that the cardinal points are never conceived apart from the ego in the center: that the subjectively prepotent part of the swastika is the intersection or common origin of the arms; that the four colors of brightening sunrise and boreal cold and blushing sunset and zephyr-borne warmth must have a complementary all-color in the middle; that the four winds are balanced against some mythic storm king (able to paralyze their powers in response to suitable sacrament) in or near the middle of the world; that the sky falls off in all directions from above the central home of the real men; that the four termini of Papago time relate to the end of the period conceived always with respect to the beginning; that the four worlds of widespread Amerindian mythology comprise two above and two below the fate-shadowed one on which the shamans have their half-apperceived existence; that the four phratries or societies are arranged about the real tribal center; and that in all cases the exoterically mystical number carries an esoteric complement in the form of a simple unity reflecting the egoistic personality or subjectivity of the thinker. It is easier to represent the quatern concept graphically than verbally—indeed it has been represented graphically by unnumbered thousands of primitive thinkers in the cruciform symbols dotting the whole of human history and diffused in nearly every human province, or in the form of the equally widespread but less conspicuous quincunx.

The exoterically quatern and esoterically quincuncial concept appears to mark a fairly definite phase of human development; a somewhat higher stage is marked by the use of six as a mystical or sacred number. In this stage the mythology remains a Cult of the Quarters, though the cardinal points are augmented by the addition of zenith and nadir, while a third upperworld and a third underworld may be added to the tribal cosmology. The ramifications of the concept are still more extended than those of the quatern idea, and lead to even more patent incongruities—particularly when the attempt is made to graphically depict the essentially tridimensional concept on a plane. Now the senary concept, like its simpler analogue, is always incomplete in itself: the six cardinal points must be reckoned from a common center, the three underworlds and the three upperworlds are reckoned from the middle world of actuality, and the six colors (for example, of corn, as among the Zuñi, according to Cushing and others) are habitually supplemented by a central all-color; so that, in this case, as in that of the quasi-quaternary system, the exoterically perfect number is esoterically perfected through the unity of subjective personality, i. e., the ever-present ego.[1] It is significant that the six-cult is much

[1] The perfecting of the mystical numbers four and six by the addition of unity has been recognized by many investigators, notably by Powell (On Regimentation, in the Fifteenth Annual Report of the Bureau of Ethnology, 1893–94, 1897, p. cxvii and elsewhere), Morris (Relation of the Pentagonal Dodecahedron . . . to Shamanism: Proceedings of the American Philosophical Society, vol. XXXVI, 1897, pp. 179–183), and Cushing (ibid., p. 185 and elsewhere).

less extensively distributed through history and throughout the world than the four-cult, though it may be traced in different continents; and it is peculiarly meaningful in establishing that marvelous prepotency of the number cult which, among many tribes, carried the nascent numeral system past the point at which nature strove, through the obvious organic structure of the hand and through simple algorithmic order, to implant the quinary system. Indeed, if further evidence than that of bestial and savage counting were required to show that finger numeration and the quinary system were not primeval, it would be afforded by the development of the senary-septenary system in so many lands.

The quaternary and senary cults illumine the binary systems prevailing among tribes still lower in the scale of intellectual development. Especially helpful is the light on the Australian aborigines, who are found thereby to exemplify what might be called a Cult of the Halves; for they are controlled by a binary concept of things expressed not only by their numeration, but even more clearly by their social and fiducial systems, which, in turn, shape their everyday conduct and speech. "The fundamental feature in the organization of the central Australian, as in that of other Australian tribes, is the division of the tribe into two exogamous intermarrying groups," say Spencer and Gillen;[1] and all other students of native Australian society have either been overwhelmed by an apparently irresolvable nebula of overlapping classes and subclasses and superclasses, or have been led to a related conclusion. Indeed the Gordian knot of entangled relationships constituting Australian society is easily cut by the student who places himself in the position of an individual blackfellow, and projects from self dichotomous class-lines occasionally uniting and bifurcating in other individuals, after the manner of the dichotomous lines of Aristotelian classification and the Tree of Porphyry; for the social classes, and the conduct involved in their maintenance, are fixed by a bifurcate series of ordinances, ostensibly descended from the mystical olden time, and put in the form of tabus and equally mystical mandates by the shamans. In like manner the obscure pantheon of the Australians seems to be arranged in nearly symmetric pairs; and even the individual shade (or mystical double of the person) is conceived as bipartite, as among the Arunta, who designate the ghostly attendants Iruntarinia and Arumbaringa, respectively.[2]

Although typically developed among the Australian aborigines, the binary philosophy is by no means confined to the Austral continent and primeval culture: it existed among the Tasmanians, it reappears in Africa, persists in China and Mongolia, and may clearly be traced in America, e. g., in the "sides" forming the primary basis of society in the Seneca and other Amerind tribes; while no fiducial system is

[1] The Native Tribes of Central Australia, by Baldwin Spencer and F. J. Gillen, 1899, p. 55.
[2] Op. cit., p. 513.

wholly free from the persistent dualism springing from binary interpretations of nature. Yet the mystical Two is no more complete in itself than the mystical Four and Six of higher culture; the primary classes or "sides" are perfected in the tribe both in Australia and in America, the Iruntarinia and Arumbaringa are conjoined in and nonexistent apart from the personality they are held to shadow, and the mandates and prohibitions of Australian (and indeed of most other) laws are perfected in permissive, or normal, conduct; in Australia indeed the central factor is so well developed that Lumholtz was led to note a ternary concept as expressing a definite "idea of the Trinity" among the southeastern tribes;[1] so that the exoterically binary system of thought is esoterically, or in subconscious fact, ternary.

The dichotomous fiducial and social structure clarifies the Australian numeral system. The abundant numerations recorded by Curr and others strongly suggest the simple binary system traced by Conant. A common form is *goona*, *barkoola*, *barkoola-goona*, *barkoola-barkoola* (1, 2, 2-1, 2-2) sometimes followed by "many" or "plenty" and more rarely by *barkoola-barkoola-goona* (2-2-1), though usually the table does not go beyond the fourth term, which may itself be replaced by "many." Now, examination of the numerous records shows (1) that none of the terms correspond with fingers; (2) that a very few of the terms correspond with the word for hand, such terms being three, four, one, and two in (approximate) order of frequency; (3) that a somewhat larger number of terms, chiefly three, one, and two, correspond with the words for man; (4) that a considerable number of threes and ones, with a few fours and twos, suggest affinities with obscure roots used chiefly in terms for man, tribe, wild dog, I, yes, etc.; and (5) that there is a strong tendency to limit the formal numeration to three. It is particularly noticeable, too, that certain persistent number-terms are used sometimes for two and sometimes for three among numerous slightly related tribes—i. e., the term is more definitely crystallized than the concept, which oscillates indiscriminately between two and three, betraying a confusion impossible to arithmetic thought. Similarly the Tasmanian numerations are binary, and without reference to finger or hand, though five sometimes appears to connote man. These features clearly indicate that the Australasians do not count on their fingers, and are without realistic notion as to the number of fingers—indeed the Pitta-Pitta of Queensland are able to count their fingers and toes only by the aid of marks in the sand,[2] while the abundant Australian pictographs reveal habitual uncertainty as to the number of fingers in the human hand (save where the picture is developed from a direct impression).

Suggestively analogous in form and meaning are certain South

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[1] Among Cannibals, 1889, p. 129.

[2] Ethnological Studies, by Walter E. Roth, p. 26.

American number-systems—e. g., that of the Toba, whose ordinary numeration ends with six (the term meaning also "many" or "plenty"), though Bárcena has traced it to ten. The terms are somewhat variable, and of such form as to imply actual or vestigial connotive character; as recorded by Quevedo[1] they are *nathedac*, *cacayni* or *nivoca*, *cacaynilia*, *nalotapegat*, *nivoca cacaínilia* (2+3), *cacayni cacaynilia* (2×3), *nathedac cacayni cacaynilia* (1+2×3), *nivoca nalotapegat* (2×4), *nivoca nalotapegat nathedac* (2×4+1), *cacayni nivoca nalotapegat* (2×4+2). Now, it is noteworthy (1) that none of the terms connotes finger, hand, or man; (2) that there are alternative terms for two in both simple and composite uses; (3) that two is the most prominent factor in the composite part of the series; (4) that one of the terms for two and the term for three are closely similar, and distinguished only by inflection; (5) that the term for four apparently connotes equality (*nalotath*=equal) and declaration (*na-pega*=they say; *sena-pega*=I say, etc.); and (6) that the system is definitively not quinary or decimal. There are suggestions, both in the combinations and connotations of the terms, of two threes of ill-defined numeric character, corresponding respectively to the numeric two and three; and that four is an essentially mechanical square. There are also many indications that the system is inchoate so far as the strictly numerical aspect is concerned.

In the dearth of knowledge concerning the original or collateral meanings of the Australian and South American number-terms, it is difficult to formulate the fundamental concept or to give it graphic expression; but a suggestion of great inherent interest is found in the Shahaptian numeration, in which, according to Hewitt, the first two integer-terms are denotive or arbitrary merely, while the term for three means Middle or Middle ONE—not middle finger or middle of the hand, but apparently a general (or semi-abstract) Middle like that of the Zuñi ritual; and the suggestion is enforced by corresponding expressions in Serian, Iroquoian, and some other Amerindian tongues. The Zuñi expression for the middle finger, as rendered by Cushing, is particularly suggestive, viz, "Counter-equally-itself-which-does";[2] and the persistent tendency to double as well as to divide is illustrated by the Hai-it terms (incorporated by Dr Thomas, postea, p. 871) for two, four, and eight, viz, *pen*, *tsoo'-ik*, and *pen'-tsoo-ik* (2×4), and still more clearly by the absence of the numeral nine—indeed this brief vocabulary displays a curious combination of the binary and quinary systems.

In the light of these analogies the Australian thought-mode, with its numerical and social and fiducial expressions, and measurably also that

[1] Arte de la Lengua Toba, por el Padre Alonso Bárcena * * * con Vocabularios * * * por Samuel A. Lafone Quevedo, Biblioteca Lingüística del Museo de la Plata, vol. II, 1898, p. 41.

[2] Manual Concepts, Am. Anthropologist, vol. v, 1892, p. 293.

of the Toba and perhaps other South American tribes, assume definite and harmonious shape in a binary-ternary system, in which things are conceived in pairs related subconsciously to an initial or central interpretative nucleus—that is, to the dominating Ego of primitive ideation.

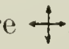
The three number-systems pertaining to prescriptorial culture are essentially distinct from modern Aryan numeration, and indeed from the whole of Arabic algorithm and arithmetic, in motive as well as in mechanism. Primarily, they are devices for divination or for connecting the real world with the supernal, and it is only later or in minor way that they are prostituted to practical uses; yet by reason of the magical potency imputed to them they dominate thought and action in the culture-stages to which they belong and profoundly affect the course of intellectual development—indeed, like other figments (or pure abstractions, dissevered from the actualities of nature), their office is first to stimulate and later to enchain mentation.

In mechanism the three systems correspond substantially, even if they are not actually correlative, for each rests on an exoteric base in the form of a small even number, and each is really controlled and perfected by a half-apperceived unity, itself the reflection of the Ego, whereby the base is raised esoterically to the next higher odd number. The systems differ only in the value of the exoteric base, which is a measure of the intellectual capacity normal to the culture-stage to which it pertains. The two higher systems have graphic equivalents which shape and intensify their mystical potency (for the mechanical conditions attending graphic representation always interact with primary concepts in primitive thought); but the lowest and presumptively primeval system is without known graphic symbol.

Notation and Augmentation

Resting as they do on inconstant and largely subjective bases, and pertaining as they do to prescriptorial culture (or at the best to inchoate ideographic representation), the primitive number systems are not susceptible of algorithmic notation. Concordantly they are insusceptible of treatment by the methods of rational arithmetic; though the two higher systems (and probably the lowest also) lend themselves to combinations made in accordance with a method or law which may be styled *augmentation*—a process tending to perpetuate itself, and, while neither addition nor multiplication, tending to generate both. This curious law of augmentation is of much significance; in the first place, it represents a process apparently lost (along with the observational basis of arithmetic) from the recorded history of mathematics; and, in the second place, it seems to explain the interrelations and evolution of the magical number-systems; again, it would seem to constitute the germ of the fundamental arithmetic processes, and hence to explain the transition from magical to rational numbers; and finally

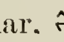
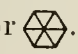
it is of no small interest as a source of those vestigial features of almacabala still persisting in Aryan culture, still cropping out in "lucky numbers" and in other fantastic forms.

The augmentation of the widely diffused quaternary-quinary system is made clear by aid of its mechanical symbolism, which combined with the egoistic concept to shape the system. The commonest (and nearly world-wide) symbol is the cruciform figure , or the quincunx,  Now, magnification of the peripheral powers or objects is readily and intuitively represented by adding a line or dot to each of the four extremities of the symbol, whereby it is converted into the simple swastika in its prevailing forms, , or  Actually the figure is sometimes developed (as among some Pueblo peoples, according to Cushing) by laying down four billets or arrows radiating from a fetishistic Middle toward the east, north, west, and south, and then adding, as the ritual proceeds, shorter transverse sticks touching the extremities of the four cardinal billets, the whole being done in such a manner as to harmonize ritual and symbol, and impress the former by the objective representation in the latter. In any case, the symbol is raised from its original value of 4+1 to 8+1; and the graphic representation accords with the shadowy concept lying behind the number system in which the mystical Middle is persistent, and can be counted but once howsoever the value be augmented. Similarly the peripheral potencies may be multiplied by the addition of dots, as in a common form of the swastika noted by Wilson,  or ,[1] or by the development of the "meander," , which thus represent, respectively, 12+1, 20+1, and 20+1; and the augmentation may proceed indefinitely, by either mechanical or mental addition, though always in accordance with the primary principle that the Middle is reckoned but once.

The mechanical conditions accompanying the development of the figure tend to maintain its symmetry, i. e., the supplementary transverse billets, or sticks, are naturally so laid as to form counterparts in relation to the primary billets and to the center; but, as pointed out by Wilson (after Max Müller and Burnouf), the additional billets completing the swastika proper may be turned either to right or to left, i. e., the development of the figure may be either clockwise or counterclockwise. The question has even been raised whether distinct names should be applied to the alternative forms; but in view of the fact that the habitual motions of primitive peoples are predominantly centripetal, or toward the body, while the predominant motions of advanced peoples are centrifugal, it seems safe to infer that the clockwise swastika represents the higher cultural plane (just as writing toward the right represents a higher plane than the archaic mode of writing

[1] The Swastika. Report of the United States National Museum for 1894, p. 767.

toward the left), and accordingly that this form would be normal if the form itself were normal to advanced culture; but that since the symbol pertains in all essential respects to the lowly culture characterized by centripetal hand-movement, the counter-clockwise form would seem to be more properly considered the normal one—and it is drawn herein.

While the concept of the senary-septenary system is much more complex than that of the quaternary-quinary system, the law of augmentation is similar; and it is significant that the similarity accompanies (and presumptively results from) analogous efforts at graphic representation. Commonly the concept is directional, as in that form of the Cult of the Quarters in which zenith and nadir are reckoned as cardinal points; and the mechanical symbol is complicated, and eventually modified, through the difficulty of depicting tridimensional relations on the bidimensional surface. Among the pueblo peoples this difficulty is overcome by bisecting two of the quadrants in a simple cruciform symbol in such manner as to produce the asymmetric figure ; but the ever-acting mechanical tendency operates to produce the regular figure  as the applications of the systems are extended. In either case, augmentation is effected by doubling or further increasing the peripheral extremities in such manner as to produce simple hexagrams, at first irregular, , and eventually regular, , or . The value of successive augmentations is expressed by the figures 6+1, 12+1, 18+1, etc., i. e., by successive additions (mechanical or mental) to a once-reckoned Middle.

Now, comparison of these two number systems, especially as illumined by the Pueblo method of depicting the fifth and sixth directions, indicates that the higher is produced from the lower simply by the superposition of a binary system on the quaternary system; and the inference, coupled with the patent fact that the higher base is the measure of increased intellectual capacity, seems to define the course of development of both systems. True, it is difficult for the arithmetical thinker to see how the mathematical pioneer missed the now-plain road from the indefinite quaternary-quinary notion to the definite quinary concept; but the fact can not be gainsaid that the road *was* missed by many primitive tribes of especially mystical cast of mind, and that it was found and followed only by the ancestors of the practical Arabs with their decimal system, the barefoot Mexicans with their vigesimal system, and a few other peoples of exceptionally vigorous mind. The failure to find so plain a way may be ascribed largely to the complete domination of primitive thought by mystical concepts; and it would seem to repeat the demonstration by other facts that throughout much of prescriptorial culture little if any use

was made of nature's abacus, the ever present human hand—for a habit of finger-counting could hardly fail to fix the quinary system in the minds of counters able to grasp so high a number as five without aid of extraneous symbols.

The growth of the senary-septenary system out of the quaternary-quinary arrangement forcibly suggests the genesis of the latter; for just as the hexagram of the higher system represents the swastika of the lower system plus a trigram of the binary-ternary system superposed by almacabalic augmentation, so the swastika itself merely represents two superposed trigrams. This view of the growth of the three systems in the order of passage from the simple to the complex is supported by all that is known of the relative intellectual capacity of their users; and it would seem to be established by the occasional advances from the binary-ternary system to the quaternary-quinary plane by some of the Australian numerations, as well as by various vestiges of the binary-ternary system along various culture lines, notably the Mongolian and Aryan.

The presumptively primeval system apparently arose spontaneously (perhaps along lines noted later) and became fixed through habitual mental effort shaped less by purpose-wrought symbols than by personal or subjective associations. Analogy with the higher systems would indicate that the number-concept outlined vaguely through the dull mentation of the Australian blackfellows might be symbolized by any regular trigram uniting the perceived pair of objects and the unapperceived Ego, i. e., connecting the objective impression with its subjective reflex; but the inequality of all social pairs in the tribal organization, the ever-varying relative potencies of the good and evil mysteries, the unequal rank of the two ghostly Doppel-ichen, and divers other indications, would suggest that a better figure for the concept would be an irregular trigram. Yet howsoever the system be represented graphically by the student (for apparently the blackfellow had no notion of notation), the law of augmentation common to the two higher systems prevailed, as is shown both by certain of the Australian number-terms and by the Mongolian vestiges—i. e., the augmentation proceeded by successive additions to a once-reckoned middle, yielding the values 2+1, 4+1, 6+1.

It is questionable whether any enlightened student will ever enter sufficiently into the prescriptorial thought represented by any considerable number of distinct primitive peoples to grasp and record all the stages and substages in the growth of number systems; yet the records already extant would seem to indicate the lines of growth in fairly adequate fashion. The records are consistent in indicating that primitive peoples used integral numbers rather as symbols of extranatural potencies than as tokens for natural values; that they combined the symbols through mechanical devices by aid of a simple rule

tending to develop into algorithmic processes; and that the mechanical arrangements employed to represent the numerical combinations tended to develop into geometric forms and symbols—the several processes being characterized by the method of reckoning from an ill-defined unity counted but once in each combination.

GERMS OF THE NUMBER-CONCEPT

The course of intellectual development defined by the three prescriptorial number-systems (2–3, 4–5, 6–7) naturally leads interest toward the inception of the number idea among lower men—something which must always remain obscure, save as illumined by analogies with lowest men and higher animals. Now, the more intelligent feral animals and the lowest known savages are fairly comparable in their capacity for counting; they are also alike in another respect of such consequence as to shape the character of both—their lives (as Ernest Seton-Thompson so well shows for the animals) are lived in the shadow of tragedies unto often early and always tragic death. This great fact of inevitable tragedy overlays all other facts woven in the web of nascent mind; the most firmly fixed habit of lowly life is that of eternal vigilance; the everpresent thought is that of ever-present danger; the dominant motive is that of mortal fear.

No line of intellectual development can be fairly traced without full recognition of the ceaseless terrors of feral life; and the primeval interpretations of environment by animals and men alike manifestly reflect their tragic experiences: The fear-born cunning of the fox engenders that care for a way of escape without which he ventures on no advance; his every intuition is molded by living realization of a two-side universe—the danger side in van, the safety side in rear—with self as the all-important center; and only religious adherence to experience-shaped instincts enables him to survive and permits his tribe to increase. The sagacious crow, even in semidomestication, constantly betrays his notion of a two-side cosmos in frequent backward glances as he surveys the novel or forbidden field in front; and he is an arrant mystic, crazed with abject terror by night, replete with flippant joy by day, and given to the formless fetishism of hoarding uncanny things in well-hidden shrines.[1] In like manner nearly all animals, from the fiercest carnivores to the timidest herbivores, manifest constant realization of three overshadowing factors in nature as they know it—factors expressed by Danger, Safety, Self, i. e., by Death and Life to Self, or in general terms, the evil of the largely unknown and the good of the fully known coordinated in the vaguely defined subject of the badness and the goodness; and the chief social activities of animal mates and parents are exercised in gathering their

[1] Wild Animals I have Known, by Ernest Seton-Thompson, 1898, pp. 72, 83.

kind into the brightness of the known, and educating their native dread of all outer darkness. So, too, the more timid tribesmen of different continents betray, in conduct and speech, a dominant intuition of a terrible Unknown opposed through self to a small but kindly Known. This intuition is not born of intertribal strife, since it is strongest in those innately amicable family groups who (despite an implication of their designation) typify lower savagery, and since it is slowly modified with the rise of self-confidence among vigorous and aggressive tribes in whose minds the good grows large with the wax of conscious power; it is merely the subjective reflection of implacable environment—yet it is vaguely personified as a grisly and horrent bestial power, flaunting specters of death by tooth and claw, by serpent venom and swallowed poison, by pitiless famine and insidious disease, by wracking storm and whelming flood, by hydra-headed chance against half-felt helplessness; and over against this appalling evil there is a less completely personified good reflecting the small nucleus of confident knowledge with its far-reaching penumbra of faith. Accordingly, the lowest men and the higher animals seem much alike in their interpretation of nature—both rest their deepest convictions on a two-side cosmos connected in and through a largely passive Self.

A vague yet persistent placement of the two ever-present sides with respect to Self is clearly displayed in the conduct of animals and men—the evil side is outward, the good side at the place or domicile of the individual and especially of the group, as is shown by the homing instinct of the wounded carnivore, by the haste of the fire-crazed horse to meet the flames in his familiar stall, by human and equine nostalgia, and by the barbarian longing for burial in native soil. Moreover, both animals and men reveal indications of instinctive placement of the sides in the individual organism; and the indications consistently point to persistent intuition of face and back as the essential factors of self. Yet there is a significant diversity in the assignment of the sides of the organism to the sides of the good-bad cosmos: In general it appears that among the lower and the more timid the back stands for or toward the evil, the face toward the good, and that among the higher and more aggressive the face is set toward the danger; thus, defenseless birds and sheep huddle with heads together, savages sleep with heads toward the fire, and timid tribesmen tattoo talismans on their backs, while litters of young carnivores lie facing in two or more directions, self-confident campers sleep with feet to the fire, and higher soldiery think only of facing the foe. The interesting and significant growth of self-confidence need not be followed; it suffices to note that the primeval concept of the organic ego, as revealed in the conduct of animals and men, appears to be that of a face-back (and not bilateral) unity, with the two sides set toward the two aspects of a cosmos conceived in fear-born philosophy.

The passage of the primeval concept of a Face-Back Ego into that notion of two cardinal points suggesting a Cult of the Halves is happily represented among those Polynesian tribes who, according to Churchill,[1] have a system of geographic coordinates dominated by two cardinal directions, primarily seaward and landward, and secondarily northward and southward, respectively; while the language and customs connote a corresponding pantheon, capriciously malevolent on the sea side and steadily benevolent on the land side. This system of orientation is especially significant as a link in the chain of conceptual evolution, and equally as an explanation of the persistence of quasi-binary systems throughout Polynesia and Australasia with their shorelands of antithetic potencies; and no less significant are the facts in their bearing on the question of the habitat of primeval man, or of the orarian prototype already inferred from other facts.[2] Although varying from tribe to tribe in its relation to the meridian, this nascent orientation is no fleeting figment, but a deep-laid instinct so firmly rooted as to control every serious thought and direct every vital industry; indeed the Samoans and related navigators have developed their orientations into one of the most marvelous instincts in the whole range of animal and human life, viz, a cognition of definite albeit invisible sailing paths, whereby they are able to traverse the open Pacific, far beyond sight of land, with a degree of safety nearly equal to that afforded by chart and compass.

The Polynesian orientation at once illumines the unformulated Cult of the Halves, and opens the way to an explanation of the Cult of the Quarters; for each point of the shore is necessarily defined by sea in front and land in rear, and also by strands stretching toward the right and toward the left. Moreover, assemblages of Polynesians and Australasians, like the Iroquoian tribal councils, find it convenient to arrange themselves in coordinate groups or "sides," so placed laterally as to face a speaker at the end of the plaza or prytaneum; and there is good reason for opining that the collective habit was soon strengthened, even if it was not initiated, by the slight asymmetry of the human body whereby the left brain receives blood a little more directly than the right and gives proportional excess of strength and cunning to the right hand. The initial inequality was doubtless too slight to yield more than barely perceptible physiologic advantage to the dextral forelimb, as Brinton and Mason and others have shown; yet it may well have sufficed to set in operation a chain of demotic interactions leading to the survival of the right-handed and the extinction of the left-handed

[1] Personal communication. While United States consul at Samoa, Mr Churchill collected voluminous linguistic and other data well worthy of publication, though not yet issued. Conformably, Lesson and Martinet note that in Tahiti north and south are distinguished by denotive terms bearing a suggestive relation to tempestuous and milder winds, while east and west are without denotive designations, and are indicated only by descriptive phrases (Les Polynésiens, vol. II, 1881, p. 314.)

[2] The Trend of Human Progress: American Anthropologist, new series, vol. I, 1899, p. 423.

throughout the earlier eons of human development. A clue to the demotic process is easily found in widespread horror of left-handedness, especially among primitive peoples; the clue becomes definite in the light of systematic infanticide among many tribes, whereby all manner of natal deformity is eliminated; it becomes conclusive in the light of the customs of those American tribes who habitually eliminate the sinistral offspring as monsters betokening the wrath of the powers. So, apparently initiated by slight physiologic difference and unquestionably intensified by demotic selection, right-handedness became even more predominant among primitive men than among their less superstitious descendants; the dexter and dextrous hand came to be exalted in scores of languages as "The One That Knows How" or "The Wise One," while the sinister hand was degraded by linguistic opprobrium unto a symbol of evil and outer darkness. Naturally and necessarily the bilaterally symmetric division of the Ego into Right and Left fell into superposition with the antecedent Face-Back concept, and produced a quatern notion such as that expressed in the Cult of the Quarters. Happily this transition is crystallized in the language of the Pitta-Pitta of Queensland, which possesses directional inflections indicating Front and Back reckoned from the Ego; and it is especially significant (in connection with the bimanual count inferred by W. E. Roth) that the inflection for Front applies also to (right?) Side.[1]

It is evident that the passage from the Cult of the Halves to the Cult of the Quarters marked a considerable intellectual advance, both in extension and in intension; and it is evident, too, that the transition must have introduced novel and distinctive thought-modes, susceptible of growth into habits and hence of crystallization into instincts. Concordantly, men in several stages of culture as well as certain higher animals are found to display habits and instincts reflecting some such system of coordinates as that formulated in the Cult of the Quarters. The habits are especially prominent among the many primitive folks who ceremoniously venerate the cardinal points, systematically orient the doorways and other structural features of their houses, and maintain social relations in terms of direction. The instincts are particularly conspicuous among horses and kine and swine with their remarkable direction-sense, and most notable of all in the mule with its curiously concentrated hereditary intelligence, and the carrier-pigeon with its carefully cultivated homing-sense. In the present state of knowledge it would be impracticable to trace confidently the entire course of development of the direction-sense in animals and men, partly because so few naturalists have sought, like Ernest Seton-Thompson, to interpret the habits and instincts of lower animals, partly because so few anthropologists have really entered the esoteric life of primitive peoples; yet it is easy to perceive the general trend

[1] Ethnological Studies, p. 2.

of the developmental lines from an obscure beginning in higher animality to a conspicuous culmination somewhere in that lower humanity in which the direction-sense is fixed by generation on generation of direction-worship. And it is not to be forgotten that the quatern concept, born of unrecorded myriads of experiences and nurtured by unwritten eons of ceremonies, is much more than an idle fancy of kiva and camp-fire. Intensified by the strongest motives of primitive life, it doubtless attained maximum strength before writing arose to divide its functions; yet despite the decadence of millenniums, it still survives in one, if not both, of the two strongest instincts of higher humanity—the instinct of orientation, with the correlative instinct of right-handedness.

On the whole, it would seem safe provisionally to trace the beginnings of the number-concept in the light of common attributes of animals and men, and especially in the strong light afforded by the late-studied workings of primitive minds; and when this is done, the lines of natural development seem clearly to define a crude philosophy, or rather a series of intuitive thought-modes, whence all almacabalic and mathematical systems must necessarily have sprung.

MODERN VESTIGES OF ALMACABALA

The character of almacabala, and the strength of its hold on the human mind, are illustrated by numberless vestiges, mainly mystical numbers and cognate graphic symbols. The entire series of mystical numbers may readily be ascertained by juxtaposing the three almacabalic number systems and the products of their augmentation under the almacabalic rule. They are as follow (the super-mystical numbers accentuated):

2–3—3, 5, 7, 9, etc.
4–5— 5, 9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 57, 61, 65, 69, 73, etc.
6–7— 7, 13, 19, 25, 31, 37, 43, 49, 55, 61, 67, 73, etc.

The vestigial uses of the binary-ternary system are innumerable. Two persists as the basis of the semi-mystical Aristotelian classification, which still exerts strong influence on Aryan thought; 2 is the basis, also, of the largely-mystical Chinese philosophy in which the complementary cosmologic elements, Yang and Yin, are developed into the Book of Changes[1]; and it finds expression, either alone or in its normal union, in most Aryan cults. The mystical 3 pervades nine-tenths of modern literature and all modern folklore; it finds classic expression in the Graces and the Fates; it is particularly strong in Germanic and Celtic literature, cropping out in the conventional Three Wishes and Three Tests (a survival of the ordeal), and also as a customary charm number; and in these or related ways it persits in half

[1] Chinese Philosophy, by Paul Carus, 1898, p. 3 et seq.

the families and most of the child-groups even of this country and of today. The concept survives, also, in all manner of trigrams—triangles, triskelions, hearts, etc.—of mystic or symbolic character.

The quaternary-quinary system survives conspicuously in the form of graphic devices, especially the world-wide cruciform symbol, which has taken on meanings of constantly increasing nobility and refinement with the growth of intelligence. Hardly less conspicuous are the classic and later literary survivals in the Four Elements—air, earth, fire, water—of alchemistic philosophy, the Four Winds of astrology and medieval cartography, the Four Iddhis of Buddha, and the Four Beasts of Revelation, with their reflections in the ecclesiastic writing of two millenniums; while the survivals in lighter lore are innumerable. The system persists significantly also in its augmentals, especially 9, 13, 25, 49, and 61. The numerical vestiges are naturally for the most part quaternary, since the quinary aspect is merged and largely lost in algorithm.

The senary-septenary system survives as the bridge connecting almacabala and mathematics. In the graphic form it became Pythagoras's hexagram of two superposed triangles, the equally mystical hexagram of Brianchon, with which Paracelsus wrought his marvels, and the subrational hexagram of Pascal, while the current hexagram of the Chinese is apparently a composite of this and the binary as well as algorithmic systems. In the numerical form, 6 and more especially 7 play large rôles in lore and in the classic and sacred literature revived during the Elizabethan period; even so recently as the middle of the century the hold of the astrologic 7 was so strong as to retard general acceptance of the double discovery of the eighth planet, Neptune; and equally strong is the hold on the average mind of certain senary-septenary augmentals, particularly those coinciding with the augmentals of the lower systems. In idealized (or reified) form, the number 7 has exerted marvellous influence on thought and conduct, especially in the medial stages of human development; according to Addis, "The common Hebrew word for 'swear' meant originally 'to come under the influence of the number 7'"[1]; and this is but a typical example of reverence for the magical number among various peoples.

In tracing vestiges in the form of augmentals, it is clearly to be borne in mind that their significance, like that of the primary numbers, is mystical rather than quantitative, so that certain augmental numbers possess greater vitality than others of corresponding arithmetic grade. This is especially true of the almacabalic doubles, notably 9 as the first augmental of 5, and 13 as that of 7; for in these and other cases the first augmental is commonly of opposite sign, in almacabalic sense, from its basis—thus, 5 and 7 are beneficent or "lucky,"

[1] The Documents of the Hexateuch, part 1, 1893, p. 35.

while 9 and especially 13 are maleficent or "unlucky" numbers. Moreover, there is a further mystical intensification in squares of the bases (perhaps growing out of mechanical or arithmetical superpositions on the mystical notions); and the charm seems to be still further augmented by coincidences between the several systems. It is partly through this mystical accentuation of the always mystical augmentals that such numbers as 9, 13, 49, and 61 become conspicuous as factors and vestiges of almacabala.

Nine survives as a mystical number in the Muses of classical mythology, in Anglo-Saxon aphorisms emphasizing the vitality of the cat and the effeminacy of the tailor, and as a recurring tale in all of the superabundant Celtic lore such as that currently recorded by Seumas MacManus; it even survived in the schoolbooks of the early part of the century in the more curious than useful arithmetic process of "casting out the nines;" and throughout the last decade of the nineteenth century the newspaper-writing jugglers with nines found (and diffused) much mystery-tinged amusement in almacabalic analyses of the numbers 1890–1899.

Glaringly prominent in the mythology of recent centuries is the bode clustering about the ill-omened first augmental of "lucky" 7—indeed it is probable that nearly half of the enlightened citizens of the world's most intelligent country habitually carry the number 13 in their minds as a messenger or harbinger of evil. The almacabalic double of 13 (which is at the same time an augumental of 5) has largely lost its mystical meaning in Europe and America, apparently through friction with practical arithmetic; but it retains no little hold on the oriental mind, and finds expression in twenty-five-fold collectives in India and China, and in a rather frequent organization of Tibetan tribes into 25 septs or formal social units. Eminently conspicuous in Europe and America is the mystical number 49, especially when expressed as 7×7; for, in the belief of a large element of European population, the seventh son of a seventh son needs no training to fit himself for medical craft, while scanners of advertising columns of American newspapers may daily read anew that the seventh daughter of a seventh daughter is a predestined secress.

Few of the larger mystical numbers have survived the shock of occidental contact; but they abound in the Orient. The coincidental-augmental 61 prevails in Tibet, where Sven Hedin found a lama, 1 out of 61 of co-ordinate rank, who professed survival for sixty-one millenniums, through a succession of exoteric deaths and esoteric reincarnations at uniform periods of sixty-one years;[1] and this odd value is explained by the designation of the sixty-first figure in the Mongolian hexagram—"The Right Way" or "In the Middle"[2]—which at

[1] Through Asia, by Sven Hedin, 1899, vol. II, p. 1132.
[2] Chinese Philosophy, p. 12.

the same time connects the Book of Changes with the nearly world-wide Cult of the Quarters and its mystical Middle. The numbers 63 and 65 are also mystical in Chinese philosophy, though their potency would seem to be dwarfed by the mechanical-arithmetical structure of the octonal square to which they have been adjusted evidently during recent centuries. Among the Hindu more or less mystical numbers abound, and many of these are found on analysis to correspond with conventional almacabalic augmentals and coincidentals; while the Buddhistic rituals and series of aphorisms often run in measures of fives, with an initial or final supernumerary—the feature being apparently fixed by a mnemonic finger-count superposed on the almacabalic system, much as the octonal count is superposed on the mystical figures in the Chinese hexagram.

Suggestive vestiges of the mystical number-groups persist widely in the form of irrational and functionless supernumeraries, such as the thirteenth loaf in the baker's dozen, the twenty-first skerret in the coster's score, the thousand-and-first night of Arabian tale, and the conventional overplus in the legal "year and a day." It is possible that the supernumerary habit was crystallized in some cases by simple object-counting so conducted as to include an additional object as a tally; but there are many indications that the habit originally sprang from almacabalic augmentation, in which the sum is always one more than the multiple of the even-number basis. Moreover, the supernumerary habit is especially characteristic of countries and culture-stages in which mystical number-jumbles are rife.

Certain of the graphic vestiges of the quaternary-quinary system are of special significance; for just as the hexagrams of the senary-septenary system bridged the way from mystical almacabala to rational geometry, so the mechanical development of symbols exoterically quatern but esoterically quinary carried intelligence across the chasm dividing the morass of almacabala from the algorithmic forelands rising into the firm ground of arithmetic. True, the passage was made easier by the coincidental structure of the hand, that natural abacus which undoubtedly served to fix the quinary system in all minds trained up to the contemplation of fives; yet the way was apparently so long from the habitual perception of lowly twos and fours to the ready grasp and combination of fives that mechanical structure was even more efficient than organic structure in guiding progress. The graphic number symbols of the Mexican codices illustrated and discussed by Dr Thomas and others epitomized the growth of a vigesimal system crystallized by the coincidence of manual and pedal structures, while both the terms and the gestures of the Zuñi finger-count analyzed by Cushing point the way in which binary prepossessions passed into quinary practices despite the obstruction of the senary

concept.[1] The most conspicuous and persistent graphic vestiges are those of the barbaric Roman notation, which barred arithmetical progress for ages, and even to-day saps vitality by its crude extravagance in form and function. In certain aspects this notation may be considered binary, or rather dichotomous, and a reciprocal of the bifurcate classification of Aristotle with the Tree of Porphyry,[2] although, as has been well shown by Cushing, the integers of the system stand for fingers and represent in their combinations the ordinary finger-counts employed throughout the lower medial strata of cultural development. In reality the system is neither perfectly binary nor fully quinary, and still less is it susceptible (by reason of the indefiniteness[3] as well as the inelasticity of the notation) of development into a complete decimal system; yet its survival as a mere enumerative system opens a vista through the millenniums to a thought-plane in which men managed to exist without arithmetic, without number systems save of the crudest, without numerical bases of ratiocination, without traceable germs of ideas now fundamental in daily thought. The Chinese number symbols also show traces of genesis and development from the lowly plane of finger-counting; but to the Aryan mind the most striking vestiges of essentially prescriptorial thought relating to numbers are those conserved in the Roman notation.

The various vestiges, verbal, proverbial, and graphic (vestiges far too many for full enumeration), at once illumine prerational numeration and seem to establish that course of development of number-concepts suggested by the customs of people still living in the lower culture-stages. Conversely, the definition of almacabala serves to explain certain curious vestiges of primitive thought prevailing even today and in the highest culture; and the vestiges and developmental outlines combine to form a useful means of tracing the general course of intellectual progress from the obscure beginnings in lower savagery toward the present culmination in modern enlightenment.

[1] Manual Concepts, American Anthropologist, vol. v, 1892, pp. 289–317. It is to be observed that throughout this luminous discussion, than in which his genius never shone more brightly, Cushing confined himself to the middle strata of development in which numerical concepts are quinary, and in which counting is habitually manual, and made no reference to the lower strata of numerical conceptuality represesented by peoples less advanced than the Zuñi.

[2] The Foundation of Science, The Forum, vol. XXVII, 1899, p. 177.

[3] Thus a prodigal publisher may burden his title-page with the cabala MDCCCCI; if a shade less prodigal of ink, he may substitute the sign MDCDI; or if still more economical of ink and no less inconsiderate of the convenience of readers, he may recast the formula as MCMI.

NUMERAL SYSTEMS OF MEXICO AND CENTRAL AMERICA

BY

CYRUS THOMAS

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NUMERAL SYSTEMS OF MEXICO AND CENTRAL AMERICA

By Cyrus Thomas

PRIMARY NUMBERS

It is well known that the vigesimal system of numeration prevailed among the Mexican and Central American tribes, at least among all which had adopted the so-called "native calendar"—that is, the calendar specially referred to in my paper entitled Mayan Calendar Systems, published in this volume. Numerous short notices and incidental mentions of the general system and completer notices of the systems of particular tribes are to be found in the early Spanish authorities and in the works of more recent writers. As, however, most if not all of them are limited in scope, relating to the system of but one tribe or people, or referring only to certain points, and as no paper devoted specially to the subject of numeral systems has appeared in English, it is deemed expedient to present this paper as a supplement to those which have preceded it. Moreover, it is believed that a résumé of the subject in the light of the recent advance in our knowledge of Mexican and Central American archæology will be acceptable to those devoting attention to the study of prehistoric Mexico and Central America.

As my paper on the calendar systems[1] related to the time system and symbols of the Mayan tribes, and incidentally to the numeral system as used by them in counting time, attention will here be paid to the numeral system in its more general application among the Nahuatlan, Mayan, and other tribes of Mexico and Central America which used the vigesimal system.

I have shown in the paper on calendar systems that in counting time

[1] This expression will be used throughout to refer to the paper mentioned above, published in this volume.

the units used by the Mayan tribes were as follow, the day being the primary unit:

1 unit of the 1st order = 1 day.
1 unit of the 2d order = 20 units of the 1st order = 20 days.
1 unit of the 3d order = 18 units of the 2d order = 360 days.
1 unit of the 4th order = 20 units of the 3d order = 7,200 days.
1 unit of the 5th order = 20 units of the 4th order = 144,000 days.
1 unit of the 6th order = 20 units of the 5th order = 2,880,000 days.

As this notation has been fully explained and discussed in the preceding paper, I pass at once to an examination of the general numeral system of the Mayan tribes. The notation given above differed from that of general application in the change of the second step from 20, as it should be according to the regular vigesimal system, to 18, probably to facilitate counting with the month factor.

As 20 is the basis of the higher counts, attention will be directed first to the steps leading up to this number. The oldest records to which we can appeal for knowledge of the system in use among the Mayan tribes are the inscriptions and codices. From these we can, however, learn only the method of *writing* numbers, not the number names; yet the method of writing will indicate to some extent the process in oral counts. Although the symbols commonly used for this purpose are now well known from the frequent notices of them which have been published, it is necessary for our present purpose that they be presented here.

From these it is seen that the count as expressed in symbols is from 1 to 4 by sing dots, or the unit repeated; but that to indicate 5 the method is changed, and a single short line is used instead of five dots. Though frequently horizontal, it is not necessarily so, but is found both in the codices and inscriptions in a vertical position; oftener, even, in the latter than in the former. The next four numbers, 6, 7, 8, and 9, are formed by adding to the single line one, two, three, and four dots or units, but 10 is represented by two parallel lines. That these lines must be parallel, or substantially so, whether horizontal or vertical, seems to be requisite in the Mayan hieroglyphic writing. Dots are added to the two lines to indicate the numbers 11, 12, 13, and 14; three parallel lines are used to represent 15,

and dots are added to these to form the numbers 16, 17, 18, and 19, where the use of symbols of this form stops, 19 being the highest number for which they appear to have been used in Mayan writing. The higher numbers were, as has been shown in my paper on calendar systems, represented by other symbols, or by relative position. Substantially the same plan of writing numerals is seen in the Roman system, the line being used instead of the dot, thus: I, II, III, IV, V, VI, VII, VIII, IX, X, XI, etc., to XIX, 19. Attention is called to this because of another resemblance which will be noticed hereafter.

Now it is apparent that if these symbols, taken in the order in which they stand, indicate the method followed in actual or oral counting, this method must have been as follows, from five upward: 5 and 1; 5 and 2; and so on to 2 fives; then 2 fives and 1; 2 fives and 2; and so on to 3 fives; then 3 fives and 1; 3 fives and 2, to 19. If this theory be true, we should expect to find terms in the language to correspond with the symbols; evidence that these existed in Mayan count appears to be wanting, yet, as favoring the theory, we do find, as will appear, that the Nahuatl and some other surrounding languages contained terms corresponding precisely with this method of counting. It is, however, somewhat strange that the Borgian codex, which is probably the oldest of the existing Mexican codices, does not use the short line for 5, but counts with single dots as high as 26, and in fact no one of these codices appears to use it in counting time from date to date, though it is used in them for other purposes. The Mayan terms from 10 to 20 follow not this quinary system but the decimal order, as will be seen. The terms used for numbers up to 20 in the Maya (or Yucatec) dialect are, according to the usual orthography, as follow:

1	hun.	6	uac.	11	buluc.	16	uaclahun.
2	ca.	7	uuc.	12	lahca.	17	uuclahun.
3	ox.	8	uaxac.	13	oxlahun.	18	uaxaclahun.
4	can.	9	bolon.	14	canlahun.	19	bolonlahun.
5	ho.	10	lahun.	15	holahun.	20	hunkal, or kal.

It is scarcely necessary to state that the orthography is varied slightly by different authors, the Spanish *j* being used by some for *h* in *hun*, *ho*, and *lahun*, and *k* substituted for *c* in *uac*, *uuc*, and *uaxac*.

It is apparent from these terms that the numbers from 12 to 19 are formed by adding 2, 3, 4, etc., to 10. The terms for 6, 7, and 8 appear also to be composite, as the terminal *c* or *k* seems to indicate either the same radical throughout, or the same suffix, though no satisfactory explanation of this point, which will be again referred to, has been presented. As additional data bearing on these questions, the names of the numbers up to 10 in the different Mayan dialects as given by Stoll[1] are added here, the Spanish *j* being used by him instead of *h*.

[1] Zur Ethnographie der Guatemala, 1884, pp. 68–69.

	Dialect	1	2	3	4	5
1	Huasteca	jun	tzab	ox	tze	bo
2	Maya	jun	ca	ox	can	jo
2a	Peten	jun	ca	ox	can	jo
3	Chontal	jumpé	chapé	uxpé	chompé	joóp
4	Tzental	jun	cheb	oxeb	chanéb	jooéb
5	Tzotzil	jun	chim	oxim	chanim	joóm
6	Chañabal	juné	chabé	oxé	chané	joé
7	Chol	jum	cha	ux	chum	joo
8	Quekchi	jun	caib	oxib	cajib	oób
9	Pokonchi	jenáj	quiib	ixib	quijib	joób
10	Pokomam	janáj	quiém	ixiém	quiejém	joóm
11	Cakchiquel	jun	ca'i	oxi	caji	vuoó
12	Qu'iché	jun	quiéb	vuoxib	cajib	joób
13	Uspanteca	jun	quib	oxib	quejéb	joób
14	Ixil	úngvual	cávual	óxvual	cájvual	óvual
15	Aguacateca	jun	cab	ox	quiáj	o
16	Mame	jun	cáve	óxe	quiáje	jóvue

	Dialect	6	7	8	9	10
1	Huasteca	akak	buk	vuaxik	belléuj	lajú
2	Maya	uak	uúk	uaxák	bolón	lajún
2a	Peten	uak	uúk	uaxák	bolón	lajún
3	Chontal	(?)	(?)	(?)	(?)	(?)
4	Tzental	uakéb	uukéb	uaxakéb	balunéb	lajún
5	Tzotzil	uakim	uukúm	uaxakim	baluném	lajuném
6	Chañabal	uaké	juké	uaxaké	baluné	lajuné
7	Chol	vuök	juk	uaxök	bolón	lujúm
8	Quekchi	vuakib	vukúb	vuakxakib	beléb	lajéb
9	Pokonchi	vuakib	vukúb	vuaxakib	belejé	lajéb
10	Pokomam	vuakim	vukúm	vuaxakim	belejém	lajém
11	Cakchiquel	vuaki	vukú	vuajxaki	belejé	lajúj
12	Qu'iché	vuakib	vukúb	vuaxakib	belejéb	lajúj
13	Uspanteca	vuakakib	vukúb	vuajxakib	belejéb	lajuj
14	Ixil	vuajil	vújvual	vuaxajil	belúvual	lávual
15	Aguacateca	ukák	vuúk	vuájxak	bélu	láju
16	Mame	vuák	uk	vuacxák	belejúj	lajúj

Before commenting on the list, the names in some other dialects of this stock not included by Stoll and some variations from the orthography of his list will be noted.

Pupuluca[1]		Chuhe[2]		Jacalteca[3]		Subina[4]	
1	hun	1	hun	1	hune	1	hun
2	káú	2	chaab	2	caab	2	cheb
3	oxí	3	oxe	3	oxuan	3	oxê
4	kiahi	4	changue	4	canek	4	chaneb
5	voó	5	hoe	5	houeb	5	hoe
6	vahatzi	6	vuaque	6	cuaheb	6	guaqueb
7	vukú	7	uke	7	huheb	7	huquê
8	(?)	8	vuaxke	8	vuaxaheb	8	guaxaqueb
9	belehé	9	vuangue	9	baluneb	9	balunê
10	lahú	10	lahne	10	lahuneb	10	lahuneb
20	hunvinack	20	hun c'al	20	hun c'al	20	tab

Membreno gives the following numerals of the Honduras Chorti, which are added here for comparison:

Chorti (Honduras)[5]

1	yuté.	4	canté.
2	chajté.	5	guajté.
3	ushté.	12	astoraj.

Huasteca—Alejandre (Cartilla Huasteca) gives for 6, *acac;* for 7, *buc;* for 8, *huaxic;* for 9, *velleuh.*

Maya—The only variation from Stoll's orthography (the Spanish *j* and the *h* being considered equivalents) is the terminal *c* for *k* in the names for 6, 7, and 8; this can, however, scarcely be considered a variation.

Tzental—Charencey (Melanges, p. 44) has given as the Tzental names of numbers what are in fact the Tzotzil names, as is evident from the vocabularies of Stoll and Guardia and also the Vocabulario Tzotzil-Español edited by Charencey.

Tzotzil—The Vocabulario Tzotzil-Español gives for 1, *ghum;* for 6, *vuaquim;* for 8, *vuaxaquin;* and for 20, *tob.*

Cakchiquel—Guardia (op. cit., p. 23) gives *vakakib* for 6, but on page 42 *vuacaqi.*

[1] Ricardo Fernández Guardia, Lenguas Indigenas Cent. Am. Siglo, vol. XVIII, pp. 35–36. Probably a mere idiom of the Cakchiquel Pupuluca, near Volcan de Agua, Guatemala.

[2] Stoll, Sprache der Ixil-Indianer, p. 146 (*h* substituted for *j*). Apparently an idiom of the Chañabal.

[3] Ibid. This author associates this dialect with the Mam group; however, in its numerals it approaches the Maya very closely.

[4] Guardia, op. cit., pp. 79–80. The number names are closely related to those of the Chañabal and Tzental dialects, if not identical with the latter. *H* is substituted for the Spanish *j*.

[5] Alberto Membreno, Hondurenismos, p. 264.

Quiche—As Brasseur's orthography (Gram. Lang. Quiche, p. 141) differs considerably from Stoll's, we give his list here:

1	hun.	4	cah, or cahib.	7	vukub.	10	lahuh.
2	cab, or caib.	5	oo, or oob.	8	vahxakib.	20	huvinak.
3	ox, or oxib.	6	vakakib.	9	beleh, or beleheb.		

Charencey follows this list, except in 8, which he writes *vaxak.*

Quekchi (*K'ak'chi, or Cakgi*)—Pinart (Vocabulario Castellano-K'ak'chi, page 7) gives for 2, *kaib;* for 4, *kaaib;* for 5, *joob;* for 6, *guakib;* for 7, *gukub;* and for 8, *guajxakib.* Charencey (Melanges, page 64) gives for 1, *hoon;* for 2, *cai;* for 3, *oxi;* for 4, *cagi;* for 5, *joob;* for 6, *wakki;* for 7, *uuku;* for 8, *wakshaki;* for 9, *belojem;* and for 10, *lajegem.*

Mam—As Stoll gives another list (Sprache der Ixil-Indianer, p. 146) which differs somewhat from that given above, and as both vary from that given in Salmeron's Arte y Vocabulario, page 156, this and Stoll's second list are given here (*j* being changed to *h*):

	Salmeron	Stoll		Salmeron	Stoll
1	hum	hun	7	vuk	vuuk
2	k'abe	caabe	8	vuahxak	vuahxak
3	oxe	ox	9	belhuh	belhoh
4	k'iahe	chyah	10	lahuh	lahoh
5	hoe	hue	20	vuink'im	vuinqui
6	vuak'ak	kak			

When the names in these lists are examined, the following points appear worthy of attention in attempting to trace their origin and determine their signification. It requires but a cursory examination to see the very close agreement, morphologically, throughout; a fact which may reasonably be assumed as indicating that they had come into use while the ethnic group was still homogeneous, and before the tribal distinctions had become marked. This conclusion agrees with the inference drawn in our paper on calendar systems from a study of the hieroglyphics. As the names of the days in all the Mayan dialects are believed by Dr Brinton to belong "to an archaic form of speech, indicating that they were derived from some common ancient stock and not one from the other," the close agreement in the numeral terms may perhaps justify the same conclusion in regard to them, especially as it is generally true that the origin of the names of the lower numbers lies back of history. This similarity also agrees with the uniformity, in the different sections occupied by the Mayan tribes, in the method of writing the numerals up to 20.

The Chontal, Chañabal, Quekchi (or K'ak'chi) and Ixil names, and those in some of the other dialects, appear to be furnished with

suffixes. These, in the numbers exceeding 1, are, in a large number of cases—as for example where the terminal letter is *b* or *m*—additions, apparently indicating the plural. In other cases, where they are joined to the name for 1, they play a different rôle; for example, the suffix *vual* in the Ixil dialect signifies turn or repetition, or, perhaps more correctly, step in counting, a sort of reflective from a vaguely defined unity connotative of direction and time; thus the name for 1, *ungvual*, may be rendered "one time"; for 2, *cavual*, "two times," etc. The plural sign may be taken as evidence that the name still holds a trace of or reference to the process of counting, and has not yet reached what we may term the abstract or purely simple form. The *pé* in Chontal, *é* in Chañabal, and *aj* (or *ah*) in Pokonchi and Pokomam, are also suffixes, though possibly merely phonetic. The replacing of *n* by *h* (or *j*), or the dropping of the letter entirely, as in *lahun*, *lahuh*, *lahu*, etc., is, of course, understood to be a mere dialectic variation.

It has been stated above that the terminal *b* or *ib*, and in some cases the *m*, are construed as suffixes denoting the plural. This conclusion is strongly supported by Charencey (Mélanges), but Stoll (Die Maya-Sprachen der Pokom-gruppe) gives a different interpretation. "By agreement," he says, "with the Ixil, an isolated *b*, complete as *ib*, is attached to the numerals 1–10 [not to 1]; it is undoubtedly to be explained as the better understood form *ib*, which appears in *vu-ib*, 'my head,' of the Aguacateca, as well as in the reflexive pronoun of the Pokonchi, Quiche, etc.; *ix-ib* would therefore have meant originally 'three human beings.'" Nevertheless this would still carry the idea of plurality and would properly receive a plural termination.

According to the same authority the suffix *aj* in *jen-aj*, Pokonchi for 1, "was chosen as the object, in which at any rate we may recognize the personal suffix *aj*, so that *jen-aj* very probably meant originally 'a man.'" This conclusion appears to me doubtful, notwithstanding Dr Stoll's thorough knowledge of the Mayan languages.

The names for the numbers 6, 7, and 8 in this list, as stated above, appear to be compound words, the terminal *k* or *c* indicating a suffix, or the radical with a prefix; as yet no generally accepted explanation of these terms has been offered. Charencey (Mélanges, page 156), following Brasseur, makes the following suggestion in regard to *uac*—6: "This corresponds to our expression 'hors, pardela, superflu, surabundant,'" in other words, over or beyond, that is, above or more than 5. Perez gives as the signification of the verb *uac*, *uacah*, "to take out one thing which is placed in another and united with it." If this be assumed as the origin of the name, it would seem to refer to counting on the fingers, turning them in while counting the first five and then opening them out in counting the next five. Although the literal signification of the names for 6, 7, and 8 may not be 5 + 1,

5 + 2, and 5 + 3, yet, judging by the Maya method of writing the numbers, shown above, and the Mexican terms, I am inclined to believe that this is the implied meaning, the words being doubtless archaic; and I will give on a later page an additional reason for this opinion.

As the names and method of counting in other languages may throw some light on the subject, the following lists of numerals up to 10 are added. The first is the Nahuatl or Mexican (using the term in its limited sense—Aztec as given by Charencey), the signification so far as satisfactorily determined being added.

Nahuatl

1 ce.
2 ome.
3 yei or ei.
4 naui.
5 macuilli ("hand taken").
6 chiqua-ce or chicua-cen (literally 5 and 1).
7 chic-ome (literally 5 and 2).
8 chicu-ei or chicu-ey (literally 5 and 3).
9 chico-naui or chiuc-naui (literally 5 and 4).
10 matlactli ("the two hands").

The term for 5, *macuilli*, is a composite word from *maitl*, hand, and *cui*, to seize or take—that is to say, the five fingers of the hand have been taken (Siméon, Dic. Lang. Nahuatl). The name for 10 is also composite from *maitl*, hand, and *tlactli*, bust or torso of the man; in other words, the two hands. It is apparent that the names for 6, 7, 8, and 9 are formed by adding the names for 1, 2, 3, and 4 to *chi* or *chico*, which here takes the place of *macuilli*, 5. The signification of this term is "at the side, in part, by fraction, a moiety," etc.; the name is apparently formed from *chico* and *ihuan* or *huan*, "near another." It is probable, therefore, that the correct interpretation is, one at the side, two at the side, etc., the 5 or hand being understood, the reference being evidently to the process of counting on the hands.

The following lists are those of related tribes belonging to the group called by Dr Brinton the "Uto-Aztecan family."[1] Some of these, as the tribes of the Shoshonean group, had not adopted the vigesimal system nor the "native calendar"; nevertheless, it is best to bring the material concerning them together, that all which seems to have any bearing on the questions that arise may be before the reader. That the boundaries of the use of the vigesimal system and "native calendar" in the southern half of North America were not governed entirely by the lines of linguistic or ethnic stocks is well known, and hence they must have been governed, in part at least, by some other influence. Possibly a careful study of the numeral systems of the

[1] This is used here provisionally, though the Bureau of American Ethnology will, according to the rule established by Major Powell, adopt the name Nahuatlan.

different tribes may throw some light on this question; hence we have thought it best to present sufficient examples, so far as our data will allow, to give a definite idea of geographic and tribal differences in the group. Examples from other stocks or families of Mexico and Central America are also given, the stock names being from Brinton.

Nahuatlecan branch

Pipil[1]		Alagüilac[2]	
1	ce	1	se
2	ome or ume	2	umi
3	yae, yei	3	jei
4	nahue, navui	4	nagui
5	maquil, macuil	5	makuil
6	chicuasin, chicuas=5+1	6	tschikuasi=5+1
7	chicome=5+2	7	tschikume=5+2
8	chicuei=5+3	8	tschikwei=5+3
9	chicunahue=5+4	9	matakticumi=(10—1)?
10	mahtlati	10	matakti
11	mahtatici=10+1	20	sempual
12	mahtatiome=10+2		
20	cempual		

[1] Stoll, Ethnog. Repub. Guatemala, p. 21. Squier, Notes on Cent. Am., p. 352.
[2] Brinton, The So-called Alaguilac Language of Guatemala, p. 376.

Sonoran branch

Cora[1]		Opata[2]		Cahita[3]	
1	ceaut or zeaut	1	se or seni	1	senu
2	huapoa or huahpoa	2	gode	2	uoi
3	huaeica	3	veide or vaide	3	vahi, or bei′bey
4	moacua or maocoa	4	nago	4	naequi
5	anxuvi or amauri	5	mazirs or marizi	5	mamni
6	a-cevi=(5)+1	6	bussani	6	busani
7	a-huapoa=(5)+2	7	seni-bussani, or seni gua bussani =1+6?	7	uobusani
8	a-huaeica or ahuveica=(5)+3	8	go nago=2×4?	8	uonaequi=2×4?
9	a-moacua or amaocoa=(5)+4	9	kimakoi	9	batani
10	tamoamata (moamati, "hand")	10	makoi	10	uomamni=2×5?
		20	seuri, or seneurini	11	uomamni aman senu=10+1
				20	tacahua, or senutacua="the body"

[1] Conant, Number Concept, p. 166, and Charencey, Melanges, pp. 15-17.
[2] Pimentel, Cuadro, Vocab. Opata, vol. II, p. 273.
[3] Ibid., Charencey, and Mélanges, pp. 15-17, and Eustaquio. Buelna, Arte Lengua Cahita, p. 199.

Sonoran branch—Continued

Pima[1]	Tarahumari[2]	Tepehuan[3]
1 youmako, or humac	1 bire, pile, or sinepi	1 uma, or huma, or homad
2 houak, or kouak, or kcéko	2 oca, or oka, or guoca	2 gokado, or gaok
3 vaik, or vaiko	3 beica, baica, or beiquia	3 veicado, or baech
4 kick? or kiik	4 nagueoca, or naguo	4 maukao
5 ponitas, huitas, or khekhtaspe	5 mariki, or marika, or mariqui	5 chetam
6 tchu-ut, or tsautep	6 pussaniki, or usaniqui	
7 wawa, or bubak	7 kichao, or quichauco	
8 kikig	8 ossanagroc, okanako, or osanaguoco	
9 umu-tchiko, or humukt	9 kimakoë or quimacoiqui	
10 wistima	10 makoé, or macoiqui	
20 kuko-wistima	20 osamacoi	

[1] Charencey, Mélanges, pp. 15–16, and Hale, Trans. Am. Eth. Soc. (per Gatschet).
[2] Charencey, loc. cit. Miguel Tellechea, Compend. Gram. Tarahumar, p. 7.
[3] Charencey, loc. cit., and Brinton, American Race, p. 337.

Shoshone branch

Cahuillo[1]	Kauvuya[2]
1 supli	1 sople
2 mewi	2 vuy
3 mepai	3 pa
4 mewittsu	4 vuitchiu
5 nome-kadnun	5 namu-kuanon
6 kadnun-supli=5+1	6 kuan-sople=5+1
7 kan-munwi=5+2	7 kuan-vuy=5+2
8 kan-munpa=5+3	8 kuan-pa=5+3
9 kan-munwitsu=5+4	9 kuan-vuitchiu=5+4
10 nomatsumi	10 nami-tchumi

[1] Conant, Number Concept, p. 165.
[2] Gatschet, Forty Vocabularies, Wheeler's Report, vol. VII (number 19).

Shoshone branch—Continued

Gaitchaim[1]	Kechi (of San Luis Rey)[2]
1 sopul	1 suploj
2 vue	2 whii
3 pahe	3 paa
4 vosa	4 witcho
5 maha-ar	5 nummu-quano (numma, "hand")
6 auva-khanuetch	6 suploj-namehon=1+5
7 se-ula	

[1] Gatschet, Forty Vocabularies, Wheeler's Report, vol. VII (number 20). [2] Ibid. (number 22).

Shoshone[1]	Pavant[2]	Southern Paiute[3]	California Paiute[4]	Shoshone[5]
1 shoui	1 soos	1 shui	1 shum-uue	1 simitich, or tchimouts
2 waii	2 wyune[6]	2 vay	2 voahay	2 hwat, or wat
3 pahi	3 piune	3 pay	3 pahi	3 pite, or manugit
4 wachoui	4 watsuene	4 vatchue	4 voats-agve	4 watsuet, or hwatchiwit
5 manēk	5 manigin	5 manigi	5 manegi	5 managet, or tchumanush
6 nāwā	6 naviune	6 navay	6 napahi	6 naviti, or natakskweyu
7 moquesi	7 tatsuene	7 mukuishe	7 tatsuu	7 tatsuit
8 nāāntz	8 niwatsuene	8 nantchui	8 voshu^{n}	8 nywatsuit
9 you-weep	9 surromsuene	9 yuvibe	9 kvanik	9 shimeromen
10 matshoui	10 tomsuene	10 mashu	10 shuvan	10 shimmer

[1] Gatschet, Forty Vocabularies, Wheeler's Report, vol. VII (number 6).
[2] Ibid. (number 5).
[3] Ibid. (number 12).
[4] Ibid. (number 11).
[5] Ibid. (number 10) and Charencey, Mélanges.
[6] Termination *une*, probably from *onee*, "to stand up."

Shoshone branch—Continued

Comanche[1]	Chemehuevi[2]	Capote Uta[3]	Hopi[4]	Takhtam[5]
1 semmus	1 shooy	1 soois	1 shukhga	1 aukpeya
2 waha	2 vay	2 wyüne	2 lei	2 vurm
3 pahu	3 pay	3 piune	3 pahhio	3 pahe
4 hagar-so-wa	4 vatchue	4 watssuüne	4 nale	4 voat-cham
5 mawaka	5 manuy	5 manegin[6]	5 tchibute	5 ma-hat-cham
6 nahwa	6 navay	6 naveune	6 navai	6 pa-ahave
7 tah-acho-te	7 mukui-she	7 navechiune	7 tsenggee	7 voatch-geve
8 nahua-wachota	8 nantchui	8 wahwatssu-üne	8 nanal	8 voa-otch
9 semmon-ance	9 yuepa	9 sooroosüüne	9 peve	9 ma-ak-ove
10 shurmun	10 mashu	10 towumsuüne	10 pakte	10 voa-ham-atch

[1] Charencey, Mélanges, pp. 15–17.
[2] Gatschet, Forty Vocabularies, Wheeler's Report, vol. VII (number 13).
[3] Ibid. (number 15).
[4] Ibid. (number 17).
[5] Ibid. (number 18).
[6] Probably "all."

Kechi (San Diego)[1]	Tobikhar[2]	Kij or Kizh[1]	Wihinacht[1]
1 tchoumou	1 pugu	1 puku	1 siñgwein
2 echyou	2 vehe	2 wehe	2 wahêiu
3 micha	3 pahi	3 pahe	3 pahagu
4 paski	4 vatcha	4 watsa	4 watsikweyu
5 tiyerva	5 mahar	5 maharr	5 napaiu
6 ksoukouia	6 pavahe	6 paboi	
7 ksouamiche	7 vatcha-kabya		
8 scomo	8 vehesh-vatcha		
9 seou-motchi	9 mahar-kabya		
10 touymili	10 vehes-mahar		

[1] Charencey, Mélanges, pp. 15–17.
[2] Gatschet, Forty Vocabularies, Wheeler's Report, vol. VII (number 21).

The five following lists from California dialects obtained and furnished by Prof. W J McGee are inserted here as the most appropriate place to introduce them:

Hai′it dialect[1]

1 wŭk′-te.	4 tsoo′-ik.	7 tä-poo′-ik.	10 mä′-tsäm.
2 pen.	5 mä′-wŭk.	8 pen′-tsoo-ik.	20 pen′-i-mä-tsäm.
3 shä-poo′-i.	6 tŭm-bak′.	9 (lacking).	

Mi′wŭk dialect[2]

1 keng′-e.	4 o′-yee-sä.	7 kā-nek′-kä-koo.	10 nä′-ä-chä.
2 o-tee′-ko.	5 mä′-sho-kä.	8 kä′-wĭn-tä.	20 nä′-ä.
3 to-long′-ko-shoo.	6 tem′-o-kä.	9 woo′-e.	30 nä′-ä-nä-ä-chä.

Yet′tripih (Tulare) dialect[3]

1 yĕlk.	4 hät-pän′-ik.	7 näm′-cheet.	10 tree′-o.
2 bŏng′-ŏy.	5 hĭt-shĭn-ik.	8 mōn′-äc.	20 bŏng′-ŏy-tree-o.
3 shä′-pĭn.	6 chŭ-dā-pe.	9 nän-eep.	30 shä′-pĭn-tree-o.

Tätätl (Kern River) dialect[4]

1 chĭch.	4 nä′-now.	7 näm′-tsĭn.	10 äm-hai-tsĭng.
2 wo.	5 mä′-ee-tsĭng.	8 näp′-n-sĭng.	20 wom′-m-hai-tsĭng.
3 pai.	6 näp′-ai.	9 lä′-ä-kee.	30 pai′-m-mai-tsĭng.

Maricopa dialect[5]

1 shān-tee.	3 ka′-mōk.	5 sŭ-rŭp.
2 kŭ-wik.	4 shŭm-pŭp.	

Three other lists from California dialects, two collected by Stephen Powers and one from Major J. W. Powell's Comparative Vocabularies (Contributions to North American Ethnology, vol. III) are added here. One of these—the Konkau—appears to be substantially the same as the Haiit of Professor McGee's lists.

Konkau *a*		Nishinam *a*		Nakum *b*	
1	wuk-teh	1	wut-teh	1	chut
2	pe-nim	2	pen	2	penneh
3	sha-pwi	3	sa-pwi	3	cha-pwi
4	ch'u-yeh	4	chui, or chueh	4	chui
5	ma-cha-neh	5	mauk	5	ma-wuk
10	ma-cho-ko	10	ma-chum	10	ma-suk

a Powers, Contrib. to N. A. Eth., vol. III, p. 313.
b Powell, Comp. Vocab., ibid., pp. 594–596.

[1] Obtained at Nevada, California, October 3, 1898, and verified at Forest Hill and Colfax.
[2] Obtained near Jamestown, California, October 18, 1898.
[3] Obtained at Tule River agency, October 25, 1898.
[4] Obtained at Tule River agency, October 25, 1898.
[5] Obtained at Ashfork, Arizona, from girl en route to San Diego, California.

Zapotecan family[1]

Zapotec[2]		Mixtec[3]		Chuchon[4] (or Chocha)	
1	tobi, tubi, or chaga	1	ec (ce?) or ek	1	ngu
2	topa, tiopa, or cato	2	wui, uvui, or uhui	2	yuu-rina,[5] or yuu
3	chona, or cayo	3	uni	3	ni-rina, or nyi
4	tapa, or taa	4	gmi, or kmi	4	nuu-rina, or ñuu
5	caayo, gayo, or goyo	5	hoho	5	nau-rina, or nau
6	xopa, or goxopa	6	ino	6	njau-rina, or nhau
7	caache, gaache or gooche	7	ucha	7	yaatu-rina, or yaatu
8	xoono, xono, or goxono	8	una	8	nh-rina, or nhi
9	caa, or gaa	9	ee	9	naa-rina, or naa
10	chii, or gochii	10	usi	10	te-rina, or te
		11	usi-ce		

[1] To conform to the rule proposed by Major Powell, which has been generally accepted, to use a single term terminating with *an* in forming family names, this family will be called the *Zapotecan*.
[2] Cordova, Arte del Idioma Zapoteco (reprint), p. 176, and Vocab. Castellano-Zapoteco.
[3] Charencey, Mélanges, p. 44.
[4] N. Leon, Introd. to Cordova, Arte del Idioma Zapoteco, p. lxxii.
[5] Leon says that *rina* appears to be a sign of the numeral adjective. This is merely a subdialect of the Chuchon.

Popoloca[1] (of Oaxaca)		Trike[2]		Mazateca[3]	
1	gou, or ngu	1	ngo	1	gu
2	yuu	2	nghui	2	hó
3	nii, or nyi	3	guañânha	3	há
4	noo, or nuu	4	kaha	4	ni-kú
5	nag-hou, or nau	5	huhûha	5	û
6	tja, or nhau	6	guatânka	6	hû
7	yaata, or yaatu	7	chiha	7	yi-tú
8	gnii, or nhi	8	tônha	8	hi-i
9	na, or naa	9	hûnha	9	ñi-há
10	tie, or te	10	chia	10	te
20	kaa	11	chânha	20	kâ
		12	chuuiha		
		20	hikoo, or kooha		

[1] N. Leon, Introd. to Cordova Arte del Idioma Zapoteco, p. lxxii. Francisco Belmar, Lengua Mazateca, p. 43 (under the name Chocha).
[2] Belmar, Ensayo sobre la Lengua Trike, 1897, p. 10.
[3] Belmar, Lengua Mazateca, p. 40.

OTHOMIAN FAMILY

Othomi[1]

1	unra, n'nra, or ra.	6	rahto, or rathto=1+5.
2	yooho, or yoho.	7	yoto, or yohto=2+5.
3	hiû.	8	chiato, or hiâhto=3+5.
4	gooho.	9	guto, or gytho=4+5.
5	kuto, gyto, kuta, or qyta.	10	reta.

Matlaltzincan or Pirinda[2] *(2 vocabularies)*

1	indawi.	yndahhuy,[3] or rahui.
2	inawi.	ynahuy, or nohui.
3	inyuhu.	ynyuhu.
4	inkunowi.	yncunohuy.
5	inkutaa.	yncuthaa.
6	inda-towi=1 to 5.	yndahtohuy.
7	ine-towi=2 to 5.	ynethohuy.
8	ine-nkunowi=2×4.	ynencunovi.
9	imuratadahati=10—1?	ynturahtadahata.
10	inda-hata.	yndahatta.
20	———.	yndohonta.

ZOQUEAN FAMILY

Zoque[4]

1	tuma.	6	tutay, or tuch tan.
2	metza, or metsan.	7	cuyay, or wueus-tuch tan.
3	tucay, or tuan.	8	tucututay, or tuduchtan.
4	macscuy, or makchtashan.	9	mactulay, or makchtuchtan.
5	mosay, or morshan.	10	macay, or makch-kan.

Mixe or Mije[5]

1	tuck, or tuuc.	7	mirsh-tuk, miish-tuk, westuuk or huextuuc.
2	metzk, or metsk.		
3	tegeug, or tukok.	8	tuk-tuk, or tuktuuk.
4	madarsk, maktashk, or mactoxc.	9	machk, tastuuk, or taxtuuc.
5	m'kosssk (?) mokoshk, or macoxc.	10	tards-tuk, makh, or mahc.
6	tech-teuchch, or tuduuk.	20	ypx.

Pupuluca (of Tepeaca)[6]

1	tuub.	5	mokoxko.	9	taxtujtujko.
2	mesko.	6	tujtujko.	10	mako.
3	tuö.	7	juxtukujtujko.	20	ipxe.
4	maktaxko.	8	tukujtujko.		

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[1] Conant, Number Concept, p. 165; Charencey, Mélanges, p. 84; Ymolina, Arte del Idioma Othomi, p. 153.

[2] One under the first name by Conant, Number Concept, p. 166; the other under the second name by Charencey, Mélanges, p. 84.

[3] Charencey regards the *yn* as a "simple prefix," whether merely euphonic or not he fails to state.

[4] Charencey, Mélanges, p. 72; E. A. Fuertes, manuscript in Bureau of American Ethnology archives; Grassierie, Lengua Zoque, in Vocab.

[5] E. A. Fuertes, manuscript in Bureau of American Ethnology archives; Grassierie, Lengua Mixe, p. 332; Stoll, Ethnog. Guatemala, p. 28.

[6] Ibid. Belongs to the Mixe group.

TARASCAN OR MICHOACAN FAMILY

Tarasco[1]

1	ma.	6	cuimu.[2]	11	temben-ma=10+1.
2	tziman.	7	yun-tziman=(5)+2.	12	temben-tziman=10+2.
3	tanimu.	8	yun-tanimu=(5)+3.	20	macquatze, or makatori.
4	tamu.	9	yun-thamu=(5)+4.		
5	yumu.	10	temben.		

CHIAPANECAN FAMILY

Chiapanec[3]

1	tige, tique, tiqui, ticao, tighe, or tiche.	8	mahumihi, or hahu-mihi.
2	hao, jomi, or húmihí.	9	helimihi.
3	haui, jami, or hemihì.	10	henda.
4	ahau-mihi, ahu-mihi, or haha.	14	henda-mahua.
5	aomihi, haomo, or haumihì.	15	henda-mu.
6	amba-mihi, or hamba-mihi.	20	hahua, hahue, ahué, or hahoy.
7	hendi-mihì.		

TOTONACAN FAMILY

Totonaca[4]

1	tum.	4	tati.	7	tushun.	10	kaũ, or cauh.
2	tuyun.	5	kitsiz.	8	tsayan.		
3	tutu.	6	tchashan.	9	nahatsa.		

Totonaca (Starr)[5]

1	tla-ka-tin.	4	la-ka-ta-te.	7	la-ka-to-hon.	10	la-kāl-xāo.
2	tla-kā-to.	5	la-ka-ki-tsis.	8	la-ka-tsai-yun.	20	la-ka-po-shan.
3	tla-kā-to-tō^{n}.	6	la-ka-cha-shun.	9	la-ka-na-hās.		

Akal'man (Vera Cruz)[6]

1	tam.	9	naxatze.
2	thoi.	10	kau.
3	thut.	11	kautam=10+1.
4	thaate.	12	kauthoi=10+2.
5	kis.	20	pusham.
6	tchashan.	30	pushamkau=20+10.
7	taxun.	40	thoipusham=2×20.
8	tsaxen.		

As the origin of the names for 1 to 4 is a question belonging largely to the deductive domain because of the very meager data bearing on the subject, it will not be discussed at any length here. The reader is, however, referred for an examination of the subject in its broad and general aspect to a paper by Professor W J McGee, entitled The Beginning of Mathematics, in the American Anthropolo-

[1] Anales de Museo Michoacan, entraga 1, p. 59, 1888.

[2] *Cu*, "to join or mix one thing with another"—N. Leon, Anales de Museo Michoacan, entraga 1, 106. Basalenque, Arte del Idioma Tarasco, p. 48, says *cu* refers to the hand.

[3] Charencey, Mélanges, p. 44; R. F. Guardia, Lenguas Indigenas Cent. Am. en el Siglo, vol. XVIII, p. 86.

[4] Grundriss, vol. II, p. 293.

[5] Notes on Ethnog. South Mexico.

[6] A. S. Gatschet, quoting Pinart, American Antiquarian, vol. IV, p. 237 (April–July, 1882).

gist, October, 1899, and to the preceding paper in this volume. This author points out that while the count of many primitive peoples has been by the fingers and hands, giving rise to the quinary and decimal systems, and sometimes by the toes and feet also, leading to the vigesimal system, yet the evidence derived from the method of counting by tribes in the lowest status seems to demonstrate that these systems are far from primeval.

He suggests that numbers of the lower scale, beginning with 1, representing the Ego, were the outgrowth of mysticism: 2, growing out of the lateral or the fore and aft aspects, being the first pausing point, and 4, the Cult of the Quarters, the second pausing point, beyond which a number of systems never advanced; to this the Ego being added gave the number 5. However, for a more complete and clear understanding of the author's suggestions on this interesting subject the reader is referred to his papers.

That the quinary system, or counting on the fingers and hand, could not have taken its rise until 5 had been reached by some other process appears to be self-evident, and is proved by the numerous systems in which 5 is not reached, and by others in which it does not form a basis. It would seem necessary, therefore, in order to obtain a satisfactory explanation of the origin of the primary numbers, to look for some other solution than the supposed method of counting on the fingers. The hand would not be likely to come into use in this respect until 5 had been reached and the attempt made to rise above that number; then the advantage of using the five fingers of the hand, or the hand as representing 5 as a basis would be perceived. Pebbles, sticks, or any other objects, would answer just as well for this purpose as the fingers until some reference to 5 was desirable, except that the latter were always convenient objects and were best adapted to use in sign language. When 5 was reached, and the advantage of using the hand became apparent, it would be used for the numbers below 5 as well as those above, but the inquiry here is, were the fingers considered so essential in counting 2 to 4, before 5 had been reached, as to bring evidence of the fact into the nomenclature? This can be determined only by obtaining the signification of the names of numbers in those dialects of tribes which have not reached 5 in their numeral systems.[1]

Orozco y Berra, speaking of the Mexican names for the numbers—*ce*, 1; *ome*, 2; *yei*, 3, and *nahui*, 4—says, "no one has given a reason for the origin of these names."[2] Chavero[3] contends that, although

[1] Conant (Number Concept, pp. 24–25) says: "It seems most remarkable that any human being should possess the ability to count to 4, and not to 5. The number of fingers on one hand furnishes so obvious a limit to any of these rudimentary systems, that positive evidence is needed before one can accept the statement. A careful examination of the numerals in upwards of a hundred Australian dialects leaves no doubt, however, that such is the fact. The Australians in almost all cases count by pairs; and so pronounced is this tendency that they pay but little attention to the fingers." The last sentence of this quotation appears to answer the author's cause of wonder expressed in the first sentence; the fingers were, it seems, considered by the Australians as no more essential in the process of counting than any other convenient objects.

[2] Anales Mus. Mex., pp. 2, 34.

[3] Op. cit., p. 33.

the Mexicans counted on the fingers and hands, 4 was the first basis, the four fingers completing the first count, 5 being formed of 4+1. He remarks as follows: "In the Hindu system the principal number of the system is 10, which is formed of 5+5; to it the number 5 is essential; but in the Nahua system the essential number is 4, hence the 20 is formed of 5 times 4, as 5 is formed of 4+1." The same author says that among the manuscript notes of Ramirez he has found one that says, "the Nahoas formed the number 5 with the four fingers of the hand, completing the sum with the thumb, as 4+1." However, it must be admitted that, in this dialect, in forming the numbers above 5 until 20 is reached, 5 is the basis, and its name is derived from the term for hand.

Charencey,[1] referring to the dialects of his so-called Chichimecan family, which corresponds substantially with Brinton's Sonoran and Shoshonean branches of his Uto-Aztecan family, says that "in almost all the idioms of this family, if not all, the name of the number 2 enters into composition in the word which signifies 4." This is very apparent in the Shoshonean branch, as is seen in the following examples:

Tribe	2	4
Cahuillo	mewi	mewittsu
Kauvuya	vuy	vuitchiu
Kechi (San Luis Rey)	whii	witcho
Shoshone (Gatschet's number 5)	wat	watsuet
Southern Paiute	vay	vatchue
California Paiute	voahay	voatsagve
Chemehuevi	vay	vatchue
Hopi	lei	nale
Tobikhar	vehe	vatcha

It is less apparent, however, in the Sonoran branch, as will be seen by reference to the lists given above.

This fact seems to bear evidence in favor of Professor McGee's suggestion in regard to the primary steps in the development of number systems—viz, that 2 and 4 were the first pausing points. An examination of other systems outside the scope of the present paper will furnish many items of evidence in this direction.

Hubert Bancroft[2] gives the following definitions of the Maya names of the first five numbers: *hun*, paper; *ca*, calabash; *ox*, shelled corn; *can*, serpent, or count; and *ho*, entry; it is apparent, however, that the meanings given can have no reference to the use of the terms as number names. However, as the origin of the names of the primary

[1] Mélanges, p. 16.

[2] Native Races, vol. II, p. 753.

numbers below 5 is not deemed of special interest in the present discussion, which relates more directly to the systems, we begin with 5.[1]

Ho or *jo*, the name for 5 in all the Mayan dialects (except the Huasteca) when the affixes are omitted, is without any signification except as a numeral, so far as is now known, that seems to be appropriate to this use. Bancroft gives "entry," as is stated above, but this, though one signification of the term, has no apparent application here. If a guess be permissible, I would offer the following suggestion: In Stoll's list for 5 we notice that the name for this number in Cakchiquel is *vuoo*, and for 15 in Quekchi is *vuolahu*, and in Cakchiquel *vuolahuh* (substituting the *h* for *j*). Now, as 6 is *uac*, *vuak*, or *vuok*, 7 *uuk*, *vuk*, or *vuuk*, and 8 *uaxak*, *uaxok*, or *vuaxak*, is it not possible that *ho* or *o* is an abbreviation of a word beginning with *u* or *vu*, as *uol*, which, in addition to its signification (as a verb) "to make round," "to will," also, according to Brasseur, signifies "filled up," "full, entire," etc.? Henderson, manuscript Maya-English dictionary, gives as another meaning "all in one," "the gross amount," and Beltran, Arte del Idioma Maya, states that in composition it signifies "todo junto," which is substantially the same signification as that given by Brasseur. The term was also used, according to all the authorities, in counting round or solid things, as bundles of cotton, etc. As Perez informs us that the ancient form of the word was *hol*, it is possible that in

[1] It is to be hoped, however, that Professor McGee, or some one who has given thought to the subject, will carry forward these investigations, as the working out of the beginnings of counting, and the origin of the lower number names, will have an important bearing on some of the problems of ethnology and linguistics not yet completely solved. The field most likely to yield fruitful results is of course to be found in the languages and customs of the lower savage tribes. The more the relation of 2 and 4 to one another is studied the more important becomes Professor McGee's suggestion that these numbers represent the first two steps in many primitive counts. The statement by Conant, quoted in the preceding note, that "the Australians in almost all cases count by pairs," seems to be exactly in line with this suggestion. Curr, to whom Conant refers as "the best authority on this subject," believes that where (among the Australians) a distinct word for 4 is given, investigators have been deceived in every case. This would seem to explain the supposed use of pairs; the 2 was used in naming the 4. This tendency, as indicated above in the text, is found in various dialects in widely separated countries. As a few examples we note the following:

	Betoya (South America)	Jiviros (South America)	Bakairi (South America)	Torres Straits
2	cayapa	catu	asage	okosa
4	cajezea = 2 with plural termination	encatu	asage-asage	okosa-okosa

	Mosquito (Central America)	Watchandies (South Africa)	Karankawa (Texas)
2	wal	utauara	haikaia
4	wal-wal	atarra-utarra	hayo hakn=2×2

Many examples might be presented, but these will suffice to show how widely spread they are, Australia and South America being the regions of most frequent occurrence, and few examples being found in Polynesian dialects.

these facts an explanation of the *ho*, the name for 5, is to be found. I offer this suggestion merely as a possible explanation, without as yet giving it my own positive acceptance.

The Mexican or Nahuatlan term for 5—*macuilli*—is as is shown above, a compound word signifying "hand taken," that is to say, one hand completed, referring to counting on the fingers. The same is also true in regard to the name in the allied Pipil and Alaguilac dialects. The name for 5 in the Opata and Tarahumari is apparently the same as the Mexican term modified by dialectic requirements. The Cahita name—*mamni*—is from *mama*, the general term for hand. Although Gallatin (Trans. Am. Eth. Soc., vol. I, p. 53) considers *kuto* or *gyto*, the name for 5 in Othomi, as uncompound, this seems to be somewhat doubtful; however, its signification is unknown to me; the same is true of the Matlaltzincan or Pirinda. The word for 5 in Tarascan—*yumu*—appears to be simple, but I am unable to determine the signification; it is not, however, the usual Tarascan word for hand. The *mihi* in *aomihi*, the Chiapanec name for 5, is a suffix common to a number of numeral terms in this dialect. This leaves *ao*, *hao*, or *mao*, written variously as the radical. The name for 5 in some of the dialects of the Shoshonean group appears to indicate "all," doubtless referring to all the fingers of the hand; for example, in the Chemehuevi, Capote Uta, Shoshoni, Pa Vant, Southern Pa Uta, and Uinta Uta dialects.

In some others the term appears to be derived from the name for "hand." It seems, therefore, that the name is usually based on the count on the hand, and implies the complete count of the fingers of one hand.

Examining now the terms for the numbers 6 to 9, we will begin with those of the Mexican proper or Aztec dialect:

chicua-ce	6.	chicu-ei	8.
chic-ome	7.	chico-naui	9.

These, as is shown above, signify or are equivalent to 5+1, 5+2, 5+3, and 5+4, the count being by additions to 5 or to one hand, and the names being compounded of *chico*, "at the side, in part," etc., *ihuan* or *huan*, "near another," and the terms for 1, 2, 3, and 4. These evidently refer to the process of counting on the fingers of the hand, and the system is a true quinary one up to 20. It would seem from this that Chavero's theory that the Mexican or Nahuatlan count was based on 4 instead of 5 can scarcely be maintained. The closely allied Pipil and Alaguilac dialects form the names for 6, 7, and 8 in the same way, but in the latter the name for 9 evidently has reference to 10.

In the Cora the numbers 6, 7, 8, and 9 are clearly based on 5, and the names are compound, being composed of *a* and the names for 1, 2, 3, and 4. Charencey (Mélanges, p. 17) says, "le *a* préfixe suivi du chiffre

de l'unité de 1 à 5 indique les nombres depuis 5 inclusivement jusqu'à 10 exclusivement, c'est le remplaçant de *chic* Aztèque." This, however, does not give us the signification of the term.

In Opata, Cahita, and Tarahumari, where there is a somewhat close agreement in the number names, especially in the first two, the method of counting from 5 to 9 appears to vary to some extent from the quinary system. If we may judge from the termination *iki* in *pussaniki*, the Tarahumari name for 6, the count has reference to 5, as seems also to be true with regard to the name for 7 in Cahita; but the name for 7 in Opata, if correctly given, is apparently equivalent to 1+6. In the three dialects the name for 8 is equivalent to 2×4; and the 9 refers to 10, *kia*, the prefix in Opata, being interpreted "antes" by Pimental. The 10 in these dialects refers to the hand. The name for 1 in Tarahumari, as given in the list—*bire* or *pile*—is considered by Charencey as abnormal, who says that *sinepi* is given in one place. This would bring the dialect into harmony with the others.

Of the dialects belonging to the Shoshonean branch, we notice that the Cahuillo and Kauvuya are regularly quinary, 6, 7, 8, and 9 being formed by adding 1, 2, 3, and 4 to 5. The Kechi of San Luis Rey appears to follow the same rule. The numbers 6 to 10 in the Tobikhar appear, so far as can be determined by the names, to be formed irregularly. The name for 7 includes that for 4; 8 is 2×4; the name for 9 includes that for 5; and 10 as given is 2×5; but in counting the numbers above 10 another term—*hurura*—is used for 10, possibly an equivalent for "man," as 20 is *hurura-vehe*=2 *hurura*. However, a more perfect knowledge of the language may show the count to be quinary.

The method of forming the numbers 6 to 9 in the dialects of the Zapotecan family can not be determined with positive certainty from the names alone, except in the Mazateca, where, if Belmar (Lengua Mazateca) be correct, it follows with great regularity the quinary system even into the higher numbers. For example, 6, *hû*, is a contraction of *û-n-gu*, or 5+1; 7, *yi-tû*, of *û-n-ho* or 5+2 (?), etc. Judging from this and the slight indications in the Chuchon, Popoloca, and Trike, these idioms appear to follow the same system. For example, in the Trike, as we learn from Belmar's "Ensayo sobre la Lengua Trike," the *anka* in *guatanka*, 6, same as *ango*, signifies "another," or "other," and the 2, *nghui*, when changed to the ordinal by the prefix *tsi*, becomes *tsi-guaaha*. That the same rule is followed in the Zapotec seems evident from the fact that above 10 the quinary-vigesimal system is followed as distinctly as in the Nahuatl, 15 having a distinct name and the count therefrom to 20 being based on it.

In the Othomi the numbers 6 to 9 are formed regularly according to the quinary system. In Pirinda 6 and 7 are formed by the addition

of 1 and 2 to 5 or its equivalent; 8 is 2×4, and 9 is based on 10. In Mixe 6, 7, and 8 are formed by adding 1, 2, and 3 to 5, but 9 is based on 10; and the same rule appears to be followed in the Zoque. In Tarasco the regular quinary order appears to prevail, though the term for 6 seems to refer to the process of counting, as the *cu* in *cuimu*, according to Basalenque (op. cit.), refers to the hand.

Passing over the other idioms of the Shoshonean group, of which the signification of the numeral terms has not been specially studied by linguists, we return to the terms for 6, 7, 8, and 9 in the Mayan dialects. It will be noticed that in all of these dialects, except the Chuhe, the name for 9 begins with *be*, *ba*, or *bo*, and that most of them, omitting the terminal *b*, add to complete the name the term for 10, *lahun*, *lahu*, etc., in more or less varied form. Thus, in Pokonchi, 9 is *be-lehe* and 10, *lehe;* in Pokomam, 9, *be-lehem*, and 10, *lehem;* in Ixil, 9, *be-luvual*, and 10, *lavual*, etc. It is evident, therefore, that in these idioms the term for 9 is based on that for 10, the *lehe*, *lun*, *lu*, and *lon* being mere abbreviations of *lahun*, *lahu*, etc. As *be* in the various dialects signifies "road, journey, way," etc., this is probably the term used here and is to be interpreted "on the way to," "next to." In Chuhe, however, the name for 9, *ru-angue*, shows that here this number, contrary to the rule which prevails in the other dialects, is formed by the addition of 4, *ch-angue*, to some equivalent of 5, thus conforming to the quinary system. It is somewhat singular, however, that the name for 19 is *ban-lahne*, the *ban* being doubtless an abbreviation of *balun*.

The *x* in the name for 8 in all the idioms seems to furnish the key to the problem of the numbers 6, 7, and 8, as it indicates that 3—*ox*, *ux*, or *ix*—is combined with some equivalent of 5 represented by *u* and *vu*, as in *u-ax-ac* and *vu-ax-ak*, to form the 8. Up to the present no suggestion as to the signification of this prefix has been presented other than what is contained in the quotation from Charencey in regard to *uac*, 6, given above. Of the correctness of the above suggestion in regard to the name for 8 there would seem to be but little doubt. If this be accepted, it follows as reasonably certain that the names, except the one for 9, correspond with the mode of counting indicated by the written number symbols; that is, with the quinary system. The numbers 6, 7, 8, and 9 in the Maya (Yucatec) dialect may therefore be written out as follows, the 5 being inclosed in parentheses to indicate that it is represented by some substitute:

6 u-ac=(5)+1.	8 u-ax-ac=(5)+3.
7 u-uc=(5)+2.	9 bo-lon=on the way to 10.

The name for 5 is not represented even by an ultimate abbreviation in the names for 6, 7, and 8, unless it be by the *u* and *vu*.

Before passing to the numbers above 10, some few examples of methods of counting by peoples bordering on or within the geographic limits embraced in this paper, and with whom some of the tribes we have mentioned must have come into contact, will be presented, as some of them are exceptional.

The first of these is a list of numerals given by Gallatin:[1] the particular tribe referred to is unknown.

San Antonio, of Texas

1 pil.
2 ajtê.
3 ajti c pil=2+1.
4 puguantzan.
5 juyopamáuj.
6 ajti c pil ajte=(2+1) 2, or chicuas.
7 puguantzan co ajti c pil=4+2+1.
8 puguantzan ajte=4×2.
9 puguantzan co juyopamauj=4+5.
10 juyopamauj ajte=5×2.
20 taiguaco.

The numbers to 10 in use among the Mosquito tribe of Honduras are as follows:

Mosquito[2]

1 kumi.
2 wal.
3 niupa.
4 wal-wal=2+2 or 2×2.
5 mata-sip=the fingers on one hand.
6 matlalkabe.
7 matlalkabe pura kumi=6+1.
8 matlalkabe pura wal=6+2.
9 matlalkabe pura niupa=6+3.
10 mata-wal-sip=fingers of the second hand.
20 twanaiska-kumi=20×1.
40 twanaiska-wal=20×2.

Dr Brinton[3] gives lists of numerals in three of the dialects of the Xinca stock as follows:

Sinacantan		Jupiltepeque		Jutiapa	
1	ica	1	ical	1	ical
2	ti	2	piar	2	piar[4]
3	uala	3	ualar	3	guarar
4	jiria	4	iriar	4	iriar
5	puj	5	pijar	5	pujar
6	tacal	6	———	6	tacalar
7	pujuá	7	puljar	7	pulluar
8	tepuc	8	apuj	8	apocar
9	uxtu			9	gerjsar
10	pakil			10	paquilar

[1] Trans. Am. Ethn. Soc., vol. 1, table A, p. 114.

[2] Conant, Number Concept, p. 121. Membreño, Hondureñismos, p. 210, under the name "Zambo del Cabo."

[3] Xinca Indians of Guatemala, Proc. Am. Phil. Soc., 1885.

[4] Dr Brinton remarks that the termination *ar* in this dialect reminds one of the Ixil termination *vual*, indicating turn or repetition, as *ungvual*, one time, *cavual*, two times, etc.

The four following lists are from R. F. Guardia (Lenguas Indigenas Cent. Am. Siglo., pages 101 and 110). The tribes are classed with the Chibcha group, a South American stock, but are, or were, located in Guatemala and Porto Rico.

Cabecar		Viceyta		Lean y Mulia		Terrava	
1	estaba	1	etabageme	1	pani	1	crara
2	boctebá	2	buttebá	2	matiaa	2	crubu
3	mañalegui	3	mañac	3	contias	3	cromia
4	quetovo	4	quiet	4	chiquitia	4	cropquin
5	exquetegu	5	exquetegu	5	cumasopni	5	croshquin
6	sehen	6	sehen	6	comasampepani=5+1	6	cloter
7	curo	7	curge	7	comasampematiao=5+2	7	crococ
8	(?)	8	(?)	8	comasampecontiac=5+3	8	croquon
9	(?)	9	(?)	9	comasampechiquitias=5+4	9	croshcap
10	dope	10	dop	10	comassopnas	10	crodobob
						11	quinsho crosa
20	ynste	20	ynste	20	comascoapssub	20	zac ybú

Another list in the last idiom—Terrava—given by Thiel,[1] differs so considerably from the preceding that it is given here:

1	krará.	4	krobking.	7	kógodeh.	9	schkawdeh.
2	krowü.	5	kraschking de.	8	kwongdeh.	10	dwowdeh.
3	krommiáh.	6	terdéh.				

II

NUMBERS ABOVE 10

Our examination of the number names and the method of counting from 10 upward will be confined chiefly to the systems of some of the more important civilized tribes of Mexico and Central America, and those of other tribes will be alluded to only where occasion may call for comparison.

The first example to be presented is that of the Nahuatl or Aztec method of counting, this being selected because it follows strictly the quinary-vigesimal system, and presents clearly the characteristics of that system, and because of its importance. The signification of the terms or the equivalents of their parts in figures will be given in connection with the list so far as known.

[1] Vocabularium der sprachen der Boruca—Terraba—und Guatuso—Indianer in Costa-Rica, Archiv. für Anth., Band XVI, p. 620.

Nahuatl[1]

10 matlactli=2 hands.
11 matlactli once=10+1, or 2 hands+1.
12 matlactli om-ome=10+2.
13 matlactli om-ei=10+3.
14 matlactli on-naui=10+4.
15 caxtolli.
16 caxtolli once=15+1.
17 caxtolli om-ome=15+2.
18 caxtolli om-ei=15+3.
19 caxtolli on-nau=15+4.
20 cempoalli[2]=1 counting or complete count.
21 cempoalli on-ce=20+1.
22 cempoalli om-ome=20+2.
23 cempoalli om-ei=20+3.
24 cempoalli on-naui=20+4.
25 cempoalli om-macuilli=20+5.
26 cempoalli on-chiqua-ce=20+5+1.
27 cempoalli on-chic-ome=20+5+2.
28 cempoalli on-chic-uei=20+5+3.
29 cempoalli on-chico-naui=20+5+4.
30 cempoalli om-matlactli=20+10.
31 cempoalli om-matlactli once=20+10+1.
32 cempoalli om-matlactli om-ome=20+10+2.
33 cempoalli om-matlactli om-ei=20+10+3.
34 cempoalli om-matlactli on-naui=20+10+4.
35 cempoalli on-caxtolli=20+15.
36 cempoalli on-caxtolli on-ce=20+15+1.
37 cempoalli on-caxtolli om-ome=20+15+2.
38 cempoalli on-caxtolli om-ei=20+15+3.
39 cempoalli on-caxtolli on-naui=20+15+4.
40 ompoalli=2×20, or two twenties.

The count follows the same order as that from 20 to 39, the only variation being in the names of the multiples of 20, that is to say, 60,. 80, 100, etc., which are as follows:

60 ei-poalli, or epoalli=3×20.
80 nauh-poalli=4×20.
100 macuil-poalli=5×20.
120 chiqua-cem-poalli=6×20, or literally (5+1)×20.
140 chic-om-poalli=7×20, or literally (5+2)×20.
160 chic-ue-poalli=8×20, or literally (5+3)×20.
180 chico-nauh-poalli=9×20, or literally (5+4)×20.
186 chico-nauh-poalli chiqua-c=9×20+5+1.
199 chico-nauh-poalli ipan caxtolli on-nau=9×20+15+4.
200 matlac-poalli=10×20.
220 matlactli on-cem-poalli=11×20, or (10+1)×20.
240 matlactli om-om-poalli=12×20.
260 matlactli om-ei-poalli=13×20.
280 matlactli on-nauh-poalli=14×20.

[1] Siméon, Dic. Langue Nahuatl, p. xxxiii.
[2] *Cempoalli* signifies one entire or complete count, from *ce*, one, and *poa* or *poua*, to be counted or estimated.

300	caxtol poalli=15×20.
320	caxtolli on-cem-poalli=16×20, literally (15+1)×20.
340	caxtolli om-om-poalli=17×20.
360	caxtolli om-ei-poalli=18×20.
380	caxtolli on-nauh-poalli=19×20.
399	caxtolli on-nauh-poalli ipan caxtolli on-nau=19×20+15+4.
400	cen-tzontli.
800	ome-tzontli=2×400.
1,200	ei-tzontli, or e-tzontli=3×400.
1,600	nauh-tzontli=4×400.
2,000	macuil-zontli=5×400.
2,400	chicua-ce-tzontli=6×400, literally (5+1)×400.
4,000	matlac-zontli=10×400.
6,000	caxtol-tzontli=15×400.
8,000	cen-xiquipilli, or ce-xiquipilli=1 xiquipilli, or 1×8,000.
16,000[1]	on-xiquipilli=2×8,000.
24,000	e-xiquipilli=3×8,000.
120,000	caxtol-xiquipilli=15×8,000.
160,000	cem-poal-xiquipilli=20×8,000.
320,000	om-poal-xiquipilli=2×20×8,000.
3,200,000	cen-tzon-xiquipilli=400×8,000.
64,000,000	cem-poal-tzon-xiquipilli=20×400×8,000.

The signification of *caxtolli*, the term for 15, does not appear to be given.

Centzontli, the name for 400, is from *ce*, 1, and *tzontli*, herb, hair, and signifies one handful, bundle, or package of herbs, or one wisp of hair, "au figuré une certaine quantité comme 400," says Siméon (op. cit.).

Xiquipilli, the name for 8,000, signifies a sack, bag, or wallet. Clavigero[2] says "They counted the cacao by *xiquipilli* (this, as we have before observed, was equal to 8,000), and to save the trouble of counting them when the merchandise was of great value [quantity?] they reckoned them by sacks, every sack having been reckoned to contain 3 *xiquipilli*, or 24,000 nuts."

It is apparent from the list given that this system was strictly quinary-vigesimal throughout, the higher bases—400 and 8,000—being multiples of 20. The retention of the quinary order in the higher numbers is evident from the use of 15 in counting 35 to 39, 55 to 59, etc. The complete maintenance of the vigesimal feature is also shown by the fact that the count from 20 to 400—that is, 20×20—so far as the multiples are concerned, is by 2, 3, etc., up to 19×20 plus the additions 1, 2, 3, etc, to 19. In its systematic uniformity it is one of the most perfect systems that has been recorded, though its nomenclature is somewhat cumbersome. Another point to which attention is called, as there will be occasion to refer to it further on, is the method of counting the minor intermediate numbers. It will be observed that the count above 40 as well as that from 20 to 40 is by additions to the base, thus: 40+1 for 41, 40+2 for 42, and so on; and the same rule is

[1] Thus Clavigero, Hist. Mex.

[2] Cullen's Trans., vol. I, 386.

true for the count from 60, 80, etc. This is mentioned because it will be found in some systems that 41 is not formed by adding 1 to 40, but is formed by counting the one on the next score—that is to say, one on the third score. This difference, slight as it seems to be, is nevertheless an important characteristic in comparing the numeral systems. The Maya method of writing numbers to 19, as shown above, is precisely in accord with the Mexican count.

The second example of the quinary-vigesimal system I present is that in use among the Zapotecs, as given by Cordova in his Arte del Idioma Zapoteco. This is so burdened with alternates that it will be best understood by presenting the regular series first and the alternates, so far as is necessary, in a separate list. The equivalent figures placed to the right show my interpretation of the terms. However, the correctness of the interpretation can be easily tested by considering the numbers up to 10 heretofore given in connection with those above 10 here presented.

Zapotec

10	chii.
11	chii-bi-tobi=10+1.
12	chii-bi-topa, or chii-bi-cato=10+2.
13	chii-ño, or chii-bi-chona=10+3.
14	chii-taa=10+4.
15	chino, or ce-caayo-quizaha-cal le=15, or 20—5.
16	chino-bi-tobi=15+1.
17	chino-bi-topa, or chino-bi-cato=15+2.
18	chino-bi-chona=15+3.
19	chino-bi-tapa=15+4.
20	cal le.
21	cal le-bi-tobi=20+1.
22	cal le-bi-topa, or cal le-bi-cato=20+2.
23	cal le-bi-chona, or cal le-bi-cayo=20+3.
24	cal le-bi-tapa, or etc=20+4.
25	cal le-bi-caayo=20+5.
26	cal le-bi-xopa=20+6.
27	cal le-bi-caache=20+7.
28	cal le-bi-xono=20+8.
29	cal le-bi-gaa=20+9.
30	cal le-bi-chii=20+10.
31	cal le-bi-chii-bi-tobi=20+10+1.
32	cal le-bi-chii-bi-topa=20+10+2.
33	cal le-bi-chii-bi-chona, or cal le-bi-chiiño=20+10+3.
34	cal le-bi-chii-bi-tapa, or cal le-bi-chii-taa = 20+10+4.
35	cal le-bi-chino=20+15.
36	cal le-bi-chii-bi-xopa=20+10+6.
37	cal le-bi-chii-bi-cache=20+10+7.
38	cal le-bi-chii-bi-xono=20+10+8.
39	cal le-bi-chii-bi-caa=20+10+9.
40	toua.
41	toua-bi-tobi=40+1.
50	toua-bi-chii=40+10.
51	toua bi-chii-bi-tobi=40+10+1.
	So to 54.

At the next step there is a change in the method, or, as will be seen when the alternates are given, the regular method is abandoned and the second method of counting adopted. Thus, instead of saying for 55 *toua bi-chino*=40+15, they say *ce-caa quiona*, or *ce-caayo quiona*= 5 from 60. The term *quiona* appears to be a variation of *cayona*, 60.

55 ce-caa quiona, or ce-caayo quiona = 5 from 60.
56 ce-caayo quiona-bi-tobi=5 from 60+1.

The correctness of this interpretation seems to be confirmed by the alternate *ce-tapacaca quizahachaa-cayona*=4 from 60.

57 ce-caayo quiona-bi-tobi=5 from 60+2.

The alternate in this case is 3 from 60, etc.

60 cayona.
61 cayona-bi-tobi=60+1.
So to 70.
70 cayona-bi-chii=60+10.
71 cayona-bi-chii-bi-tobi=60+10+1.
So to 74.

At the next step—75—the order changes as at 55, for, instead of saying *cayona-bi-chii-bi-caache*=60+10+5, they say *ce-caa-taa*, or *ce-caayo-taa*=5 from 80.

75 ce-caayo-taa=5 from 80.
76 ce-caayo-taa-bi-tobi=5 from 80+1, or ce-tapa-quizahachaa-taa=4 from 80.
So to 79.
80 taa.
81 taa-bi-tobi=80+1.
90 taa-bi-chii=80+10.
95 ce-caayo-quioa=5 from 100.
96 ce-caayo-quioa-bi-tobi=5 from 100+1, or ce-tapa-quizahachaa-cayoa =4 from 100.
100 cayoa.
101 cayoa-bi-tobi=100+1.
120 xopalal-le=6×20.
121 xopalal-le-bi-tobi=120+1.
130 xopalal-le-bi-chii=120+10.
135 ce-caayo-caachelal-le=5 from 140.

The rule given above is followed throughout.

140 caachelal-le=7×20.
150 caachelal-le-bi-chii=140+10.
160 xoonolal-le=8×20.
170 xoonolal-le-bi-chii=160+10.
180 caalal-le=9×20.
190 caalal-le-bi-chii=180+10.
200 chiia=10×20?
210 chiia-bi-chii=200+10.
220 chiia-cal-le=200+20.
240 chiia-toua=200+40.
260 chiia-cayona=200+60.

280 chiia-taa=200+80.
300 chinoua (probably 15×20)
400 tobi-ela, or chaga-el-la=1×400.
500 tobi-ela-cayoa=400+100.
800 topael=2×400, or catoela=idem.
1,000 catoel-la chiia=2×400+200.
1,600 tapa-ela=4×400.
4,000 chii-ela=10×400.
8,000 chaga-çoti, or tobi-çoti=1×8000.

Cordova adds at this point: "Hasta aqui es toda la quenta de los yndios, y de aqui arriba van contando do ocho en ocho mil arriba esta declarado."

Of the alternates above alluded to it is only necessary to mention the following:

15 ce-caayo-quizaha-cal le=5 from 20.
17 ce-chona-quizaha-cal le=3 from 20.
18 ce-topa-cal le, or ce-topa-quizaha-cal le=2 from 20.
19 ce-tobi-cal le, or ce-tobi-quizaha-cal le=1 from 20.

The alternates for the numbers 35 to 39 follow the method of counting from 55 to 59, 75 to 79, and 95 to 99 mentioned below, thus:

35 cecaatoua, or cecaayotoua=5 from 40.
36 cecaayotoua-bitobi=5 from 41; or cetapa caca quizah chaatoua=4 from 40.
So to 39.

A thorough knowledge of the language, enabling us to furnish a complete explanation of the terms and particles added and interjected in forming the intermediate numbers in the higher counts, would be more satisfactory. However, it is believed that the number equivalents given in the list will be found correct.

It is apparent from the list that the system is vigesimal and to some extent quinary-vigesimal (note the names for 15, 55, etc.) The most notable feature, however, is the intermediate position it seems to hold between the Aztec and the Maya systems. The tendency toward the quinary method and the use of a special term for 15 ally it on the one hand to the Aztec system, while, on the other hand, in the reference in counting to the next higher score, which will hereafter be shown as a feature of the Mayan systems, it resembles them. It is possible, however, that a more thorough knowledge of the language and the system may show that the names for 15, 40, etc., which have been assumed to be simple, uncompounded terms, are in fact composite. While *chino* is the usual term for 15, the alternate is *cecaayo-quizaha-calle*, which is equivalent to 5 from 20, showing direct reference to 5. It is possible, therefore, that *chino* is composite. As *toua*, the name for 40, contains the first syllable of *topa*—name for 2—it may also be, and probably is, composite; this supposition seems strengthened by the fact that *cayona*, the name for 60, appears to be based on *cayo*, 3; and *taa*, name for 80,

on *tapa* or *taa*, 4; and *cayoa*, name for 100, on *caayo*, or 5. The similarity of the name for 20—*calle*—in this language and *cal* or *kal*, the term for the same number in most of the Mayan dialects, is noticeable, though apparently accidental.

The next numeral system referred to is that of the Mazateca, a tribe speaking a dialect of the Zapotecan family. This, if correctly given by Francisco Belmar, in his Ligero Estudio sobre Lengua Mazateca,[1] presents one of the most complete examples of the quinary system to be found in Mexico or Central America. In order that the formation of the names may be more apparent, the list from 1 to 10, which has been heretofore given, is repeated here.

Mazateca

1	gu.
2	ho.
3	ha.
4	ñi-hu.
5	û.
6	hû.
7	yi-tu.
8	hi-i.
9	ñi-ha.
10	te.
11	te-n-gu=10+1.
12	te-n-ho=10+2.
13	te-n-ha=10+3.
14	te-ni-hu=10+4.
15	te-û=10+5.
16	te-û-n-gu=10+5+1.
17	te-û-n-ho=10+5+2.
18	te-û-n-ha=10+5+3.
19	te-û-ñi-hu=10+5+4.
20	kâ.
21	kâ-n-gu=20+1.
22	kâ-n-ho=20+2.
23	kâ-n-ha=20+3.
24	kâ-ñi-hu=20+4.
25	kâ-û=20+5.
26	kâ-hu (kâ-û-n-gu)=20+5+1.
27	kâ-yitu (kâ-û-n-ho)=20+5+2.
28	kâ-hii (kâ-û-n-ha)=20+5+3.
29	kâ-ñika (kâ-û-ñi-hu)=2+5+4.
30	kâ-te=20+10.
31	kâ-ne-n-gu=20+10+1.
32	kâ-te-n-ho=20+10+2.
33	kâ-te-n-ha=20+10+3.
34	kâ-te-ñihu=20+10+4.
35	kâ-te-û=20+10+5.
36	kâte-hû (kâte-û-n-gu)=20+10+5+1.
37	kâte-yitu (kâte-û-n-ho)=20+10+5+2.
38	kâte-hii (kâte-û-n-ha)=20+10+5+3.
39	kâte-ñiha (kâte-û-ñihu)=20+10+5+4.

[1] Pp. 40–43.

40	yi-cha=2×20.
41	yicha-ngu=40+1.
	So to 45.
46	yicha-hû (yicha-û-ngu)=40+5+1.
	So to 49.
50	yichite (or ichite)=40+10.
51	ichite-ngu=40+10+1.
	So to 55.
56	ichite-hû (ichite-û-ngu)=40+10+5+1.
	So to 59.
60	ichite-ko-te=50+10, or literally 40+10+10.
61	ichite-ko-te-ngu=50+10+1.
	So to 65.
66	ichite-ko-te-hû (ichite-kote-ngu)[1]=50+10+5+1.
	So to 69.
70	ichite-koho-kâ=50+20.
71	ichite-koho-kâ-ngu=50+20+1.
	So to 75.
76	ichite-koho-kâ-hû (ichite-koho-kâ-û-ngu)=50+20+5+1.

Belmar does not give any explanation of the *koho* in these names; however, it seems—though one signification of *ho* is two—to play no other rôle here than *ko* in the name for 60, etc.

80	ichite-koho-kate=50+20+10, literally 40+10+20+10.
90	ichite-koho-yicha=50+40.
95	ichite-ko-ho-yicha-û=50+40+5.
100	û-cha=5×20.
110	û-cha-te=5×20+10.
200	ho-ûcha=2×5×20.
300	ha-ûcha=3×5×20.
	So to 900.
1, 000	te-ûcha=10×100, literally 10×5×20.
2, 000	ho-mi (ho-te-ûcha)=2×10×100.
	So to 9,000.
10, 000	te-mi (kâ-ûcha)=?

There seems to be some mistake here in Belmar's parenthetical explanation; if *kâ* is 20 and *ûcha* 100, *kâ-ûcha* would be 2,000, which, as shown above from his own list, is (*ho-te-ûcha*). As *mi* is given as the equivalent of *te-ucha*, 1,000, then 10,000, unless varying from the rule, should be *te-te-ûcha*, or *kâ-û-ûcha*=20×5×100; the latter is probably what was intended, as we judge from the following numbers:

20, 000	ka-mi (kâ-te-ûcha)=20×10×100.
30, 000	kâte-mi (kâte-te-ûcha) =30×10×100.
	So to 90,000.
100, 000	ûcha-te-ûcha=100×10×100.
110, 000	ûchate-te-ûcha=110×10×100.
130, 000	ûcha-kate-te-ûcha=(100+30)×10×100.

Although this numeral system carries out the quinary count to an unusual extent, yet it is clearly quinary-vigesimal. It is a little strange,

[1] In this, as in the three following numbers (not given here), Belmar, whose list I follow, seems, probably by a slip of the pen, to have failed to give the complete name; it certainly should be *ichite-kote-û-ngu*.

however, that 10 should have what appears to be a simple integral name. The name for 20 is also simple, but that for 40—*yi-chá*—is composite, signifying 2 times 20. The intermediate minor numbers in this system are always added to the preceding base and not, as in so many others, on that which follows, nor are they subtracted from a higher base or number, as we have found to be the case in the related Zapotec.

Some of the number counts which appear to follow somewhat closely the quinary-vigesimal system having been presented, the next method of counting to which attention is called is that used by the Maya. As this system is the one in which most interest centers because of its relation to the numerals found in the codices and inscriptions, we shall dwell upon it more fully than we have upon the others, beginning with the numerals used by the Maya proper (Yucatecs). We take as our basis the series as given by Beltran in his Arte del Idioma Maya, placing at the right the interpretations or equivalents of the terms.

Maya

10	lahun.
11	buluc.
12	lah-ca=11+2.
13	ox-lahun=3+10.
14	can-lahun=4+10.
15	ho-lahun=5+10.
16	uac-lahun=6+10.
17	uuc-lahun=7+10.
18	uaxac-lahun=8+10.
19	bolon-lahun=9+10.
20	hun-kal=one 20, or kal.
21	hun-tu-kal=1+20, or 1 to 20.
22	ca-tu-kal=2+20.
23	ox-tu-kal=3+20.
24	can-tu-kal=4+20.
25	ho-tu-kal=5+20.
26	uac-tu-kal=6+20.
27	uuc-tu-kal=7+20.
28	uaxac-tu-kal=8+20.
29	bolon-tu-kal=9+20.
30	lahu-ca-kal=10+20.
31	buluc-tu-kal=11+20.
32	lahca-tu-kal=12+20, literally 10+2+20.
33	oxlahu-tu-kal=13+20, literally 3+10+20.
34	canlahu-tu-kal=14+20.
35	holhu-ca-kal=15+20.
36	uaclahun-tu-kal=16+20.
37	uuclahu-tu-kal=17+20.
38	uaxaclahu-tu-kal=18+20.
39	bolonlahu-tu-kal=19+20, literally 9+10+20.
40	ca-kal=2×20.

Up to this point the forms are quite regular, except that of 11, which has a name as yet uninterpreted by the linguists. With this

exception, the numbers from 10 to 19 are formed by the addition of 1, 2, 3, etc., to 10, the decimal system applying here. Twenty has a distinct name—*kal*. From 21 to 39 the numbers are formed by the addition to 20 of the numbers from 1 to 19; and 40 is twice 20.

Before alluding to the change which occurs in the next step, attention is called to *lahun*, the name for 10. Dr Brinton[1] says it is apparently a compound of *lah* and *hun*, and gives as the probable signification, "it finishes one (man)." As to its derivation, I think he is correct, as *lah*, as a substantive, signifies "end, limit, all, or the whole," and *hun* "one." The signification of the term would therefore seem to be "one finish," or "ending," or "all of one count," but not "one man." Henderson, in his manuscript Maya-English Dictionary, under *lah*, says, "whole hands," and this is doubtless the true rendering when used in this connection. *Kal*, 20, as a verb signifies "to fasten, shut, close," as a substantive, "a fastening together, a closing or shutting up."

Calling 20 a score, for the sake of simplicity, the count from 21 to 39 may be illustrated thus: *hun-tu-kal*, 1 on the score, or first score; *ca-tu-kal*, 2 on the score, etc. Here the addition is to the score already reached, but the additions to 40—*ca-kal*—or second score are counted differently, for 41, instead of being *hun-tu-cakal*, is *hun-tu-yoxkal*, the latter—*yoxkal* or *oxkal*—being the term for 60, or third score (3×20). As it is evident that this can not signify 1 added to 60, there has been a difference of opinion as to the true meaning of the expression and as to its correctness. Perez, as quoted by Dr Brinton, says, in an unpublished essay in the latter's possession, that Beltran's method of expressing the numbers is erroneous; that 41 should be *hun-tu-cakal;* 42, *ca-tu-cakal;* 83, *ox-tu-cankal*, etc. Nevertheless, as Dr Brinton has pointed out, the numerals above 40 are given in Perez's Dictionary of the Maya Language according to Beltran's system, which appears from other evidence to be correct.

Léon de Rosny[2] suggests that *hun-tu-yoxkal* should be explained thus: 60—20+1. However, the correct rendering appears to be 1 on the third score, or third 20. It is possible that an old and a new reckoning prevailed among the Mayas, as apparently among the Cakchiquels. According to Stoll[3] the latter people had an old and a more recent method of enumerating, which may be represented as follows:

Old		New
41	hun-r-oxc'al	ca-vinak-hun
42	cai-r-oxc'al	ca-vinak-cai, etc

[1] Maya Chronicles, p. 88.

[2] Numération des Anciens Mayas, in Compte-Rendu Cong. Internat. Américanistes, p. 449; Nancy, 1875.

[3] Zur. Ethn. der Guatemala, p. 136.

Perez says that *tu* is an abbreviation of the numeral particle *tul*, but Rosny[1] says, "Je crois que ce n'est point, comme il [Bancroft] le suppose, la simple conjonction 'et,' mais une phrase des mots *ti-u*, 'dans son, à lui, sien'; *u* est un pronoun appele par les grammairiens Espanols 'mixte' et qui forme la copulation, comme en Anglais l' *s* du genitif." Dr Berendt adopts the same opinion, which is probably correct.

As Beltran's method seems to have been followed in all the Maya lexicons down to and including Henderson's manuscript dictionary, it is followed here.

41	hun-tu-yoxkal=1 on or to the third 20, or third score.
42	ca-tu-yoxkal=2 on or to the third 20, or third score.
43	ox-tu-yoxkal=3 on or to the third 20, or third score. So to 49.
50	lahu-yoxkal[2]=10 on the third 20, or third score.
51	buluc-tu-yoxkal=11 on the third 20, or third score. So to 59.
60	oxkal=3×20.
61	hun-tu-cankal=1 on the fourth score, etc.
70	lahu-cankal=10 on the fourth score, etc.
71	buluc-tu-cankal=11 on the fourth score, etc.
80	cankal=4×20.
90	lahu-yokal=10 on the fifth score.
100	hokal=5×20.
101	hun-tu-uackal=1 on the sixth score.
110	lahu-uackal=10 on the sixth score.
119	bolonlahu-tu-uackal=19 on the sixth score.
120	uackal=6×20.
130	lahu.uuckal=10 on the seventh score.
140	uuckal=7×20.
150	lahu-uaxackal=10 on the eighth score.
160	uaxackal=8×20.
170	lahu-bolonkal=10 on the ninth score.
180	bolonkal=9×20.
190	lahu-tu-lahunkal=10 on the tenth score.
200	lahunkal=10×20.
210	lahu-tu-buluckal=10 on the eleventh score.
220	buluckal=11×20.
230	lahu-tu-lahcakal=10 on the twelfth score.
240	lahcakal=12×20.
250	lahu-tu-yoxlahunkal=10 on the thirteenth score.
260	oxlahukal=13×20.
270	lahu-tu-canlahukal=10 on the fourteenth score.
280	canlahunkal=14×20.
290	lahu-tu-holhukal=10 on the fifteenth score.
300	holhukal=15×20.
310	lahu-tu-uaclahukal=10 on the sixteenth score.
320	uaclahukal=16×20.
330	lahu-tu-uuclahuka =10 on the seventeenth score.
340	uuclahukal=17×20.

[1] Op. cit.

[2] The reason for the omission of *tu* in 50, 70, and 90 is not apparent.

350	lahu-tu-uaxaclahukal=10 on the eighteenth score.
360	uaxaclahukal=18×20.
370	lahu-bolonlahukal=10 on the nineteenth score.
380	bolonlahu-kal=19×20.
390	lahu-hunbak=10 on 1 bak.
400	hun-bak=one 400.
500	ho-tu-bak [hokal-tu-bak?]=100+400?
600	lahu-tu-bak [lahun-kal-tu-bak?]=200+400?
700	holhu-tu-bak [holhu-kal-tu-bak?]=300+400?
800	ca-bak=2×400.
900	ho-tu-yoxbak [hokal-tu-yoxbak]=100 on the third bak, or third 400.
1,000	lohu-yoxbak, or hunpic (modern).
2,000	capic (modern).
8,000	hun-pic (former and correct use of the term).

So far I have followed Beltran's list, as it is that on which the numbers as given by subsequent writers and lexicographers are based, but it carries the numeration only to 8,000. The names for 500, 600, and 700 appear to be abbreviated; I have therefore added in brackets the supposed complete terms. These, however, as will be seen by comparison, follow the rule which prevails from 20 to 39, that is, the additions are to the last preceding basal number, and not toward that which is to follow; the first rule holds good from 41 to 399, but the second is followed after passing 800 or *ca-bak*, as 900 is *ho-tu-yoxbak*, or, complete, *hokal-tu-yoxbak*, which is equivalent to 100 on the third bak. The use of *hunpic* for 1,000 was adopted after the arrival of the Spaniards. One reason mentioned by Beltran for the change was to prevent confusion and to facilitate the numbering of the century in giving dates. The proper native expression for 1,000 was *lahu-yoxbak*, or, complete, *lahunkal-tu-yoxbak*, equivalent to 200 on the 3d bak. *Capic*—2,000—is in accordance with modern usage; according to native usage 2,000 would be *hobak*, or 5×400. In counting the minor numbers above 400 the particle *catac*, "and," was inserted, thus: 450, *hunbak catac lahuyoxkal*. However, in counting the added hundreds, *tu*, and not *catac*, was inserted, as is seen above in 500, 600, and 700; hence, as Beltran indicates, the latter was only prefixed or preposed to the minor numbers.

Bak as a numeral is supposed to be derived from the verb *bak*, *bakah*, "to roll up," "to tie around," and hence presumably refers to a bundle or package. *Pic* signifies "cotton cloth," also a kind of petticoat, which appears to have been the original meaning; as this article of dress was occasionally used as a sack the numeral term probably refers to it in this sense; and Henderson, in his manuscript dictionary, gives as one signification "a bag made out of a petticoat." This interpretation corresponds with the Mexican term for 8,000.

The count from 400, or one bak, when carried out regularly, would be 2 bak, 3 bak, and so on to 19 bak; 20 bak, or 8,000, forming a new

basis to which the name *pic* or *hun-pic*, one pic, was applied. Above this number the count continued by multiplication, thus:

ca-pic =2×8,000.
ox-pic =3×8,000.
can-pic=4×8,000.

and so on to *bolonlahun-pic*, or 19 pic.

For 20 pic, or 160,000, another simple term—*calab*—is introduced; and for 20 calab, or 3,200,000, another simple term—*kinchil*—is introduced; and for 20 kinchil, the term *alau*. The series of primary or basal terms are therefore as follows:

20 units	=1 kal	=	20.
20 kal	=1 bak	=	400.
20 bak	=1 pic	=	8,000.
20 pic	=1 calab	=	160,000.
20 calab	=1 kinchil	=	3,200,000.
20 kinchil	=1 alau	=	64,000,000.

In reference to the signification of *calab*, Dr Brinton[1] writes as follows: "*Calab* seems to be an instrumental form from *cal*, to stuff, to fill full. The word *calam* is used in the sense of excessive, overmuch." His note (1) is as follows: "'*Cal;* hartar o emborrachar la fruta.' Diccionario Maya-Espanol del Convento de San Francisco, Merida, MS. I have not found this word in other dictionaries in my reach." As Perez, Brasseur, and Henderson give as one meaning of *calab*, "infinitely, many times," it is probable that this was the sense in which it came into use as a numeral adjective, a more definite meaning being afterward applied. Henderson gives as another signification "a buckle," but this may be modern. *Zotzceh*, which is sometimes used in place of *kinchil*, signifies "deer skin," but the latter term has received no satisfactory interpretation. As *chil* is interpreted by the lexicographers "knapsack, granary, barn," it is possibly the clue to the signification. The highest term—*alau*—remains unexplained. As *pic* has been used in post-Columbian times to denote 1,000, *kinchil* has been used to signify 1,000,000.

Before commenting further on this system it will be best to present the data at hand relating to the count above 10 by other tribes of the Mayan group, and by some tribes of surrounding stocks.

Huasteca[2]

10	lahu.	17	lahu-buk=10+7.
11	lahu-hun=10+1.	18	lahu-huaxik=10+8.
12	lahu-tzab=10+2.	19	lahu-belleuh=10+9.
13	lahu-ox=10+3.	20	hum-inik=1 man.
14	lahu-tze=10+4.	30	hum-inik lahu=20 (or 1 man)+10.
15	lahu-bo=10+5.		
16	lahu-akak=10+6.	40	tzab-inik=2×20.

[1] Maya Chronicles, p. 45.

[2] Stoll, Zur Ethnog. Guatemala, pp. 68-70, and Marcelo Alejandre, Cartilla Huasteca, p. 153 (*h* is substituted for *j*. Alejandre uses the terminal *c*, but to be uniform with Stoll, I have substituted *k*).

Huasteca—Continued

50	tzab-inik lahu=2×20+10.	800	huaxik-boinik=8×100.
60	ox-inik=3×20.	900	belleuh-inik=9×100?
70	ox-inik lahu=3×20+10.	1,000	hum xi.
80	tze-inik=4×20.	2,000	tzab xi=2×1,000.
90	tze-inik ca-lahu=4×20+10.	3,000	ox xi=3×1,000.
100	bo-inik=5×20.	4,000	tzaboinik xi? (tze xi?)
200	tza-boinik=2×100.	5,000	boi xi=5×1,000.
300	ox-boinik=3×100.	6,000	akak xi=6×1,000.
400	tze-boinik=4×100.	7,000	buk-inik xi? (buk xi?)
500	bo-boinik=5×100.	8,000	huaxik xi=8×1,000.
600	akak-boinik=6×100.	9,000	belleuh-hinik xi? (belleuh xi?)
700	bu-unik=7×100?		

It is apparent that from 100 upward the count is in accord with the decimal system, though the 5 times 20 to make the 100 is retained. *Xi*, the term for 1,000, appears to be modern, or, what is more probable, it is the term formerly used for 8,000, but changed, as *pic* in Maya, to 1,000; it is probably derived from *xil* or *xiil*, "hair." Several of the terms taken from Alejandre's list appear to be doubtful, to wit, those for 700, 900, 4,000, 7,000, and 9,000. Possibly the name for 700 is a shortened form of *buk boinik* and that for 900 of *belleuh boinik*, but this explanation will not apply to the other three, as *tzaboinikxi*, to conform to the system, would be 200×1,000 or 200+1,000. The proper term according to the rule would seem to be *tzexi*. I am unable to offer any other explanation of the terms for 7,000 and 9,000 than that *inik* has been improperly inserted. No data are available for determining the method of counting the minor additions from 41 to 59, 61 to 79, etc.

The next system of numeration to be considered is that of the Quiche, to which special attention is called for the reason that it is given somewhat fully by Brasseur, who seems to have studied it carefully, and who furnishes explanations drawn from his knowledge of the language. It therefore affords a good basis of comparison with the systems of other dialects of the same family, especially with that of the Maya proper.

Quiche[1]

10	lahuh.	17	vuk-lahuh=7+10.
11	hu-lahuh=1+10.	18	vahxak-lahuh=8+10.
12	cab-lahuh=2+10.	19	beleh-lahuh=9+10.
13	ox-lahuh=3+10.	20	hu-vinak=1 man.
14	cah-lahuh=4+10.	21	huvinak-hun=20+1.
15	o-lahuh=5+10.	22	huvinak-cab=20+2.
16	vak-lahuh=6+10.		

This continues to 39, the minor numbers 3–19 being placed after the huvinak or 20. However, it would have been more satisfactory if the author had written out more fully these added numbers to 39, thus

[1] Brasseur de Bourbourg, Grammaire Langue Quiche, pp. 141–146.

enabling us to see whether there are any contractions of the terms for 11 to 19 as given above.

40 cavinak=2 men or 2×20.

From this the *vinak* for 20 is replaced by *qal*, which is really the proper term in Quiche for the number 20, and corresponds with the *kal* (20) of the Maya dialect.

41 hun-r-oxqal=1 on the third score, or third 20.
42 cab-r-oxqal=2 on the third score, or third 20.
43 oxib-roxal=3 on the third score, or third 20.

This continues to 59 by prefixing the numbers 4–19 to *roxqal*. The latter term is composed of the possessive *ri* sincopated to *r*, and *ox-qal*, 3×20. The counting, therefore, is precisely as in the Maya dialect; that is to say, from 21 to 39 the minor additions (1–19) are made to the first score, or 20, but from 41 to 59 they are counted as so many on the following or third score. This method is followed, as will be seen, up to 399.

60 ox-qal=3×20.
61 hun-ri-humuch=1 on the fourth score.
62 cab-ri-humuch=2 on the fourth score.
63 ox-ri-humuch=3 on the fourth score
80 humuch.

The name *humuch* is composed of *hun*, 1, and *much*, a measure of quantity, a little mass or pile comprising 4 qal of cacao nuts.

81 hun-r-oqal=1 on the fifth score.
82 cab-roqal=2 on the fifth score.
83 oxib-roqal=3 on the fifth score.
So to 99.
100 o-qal=5×20.
101 hu-ri-vakqal=1 on the sixth score.
102 cab-ri-vakqal=2 on the sixth score.
103 oxib-ri-vakqal=3 on the sixth score.
So to 119.
120 vak-qal=6×20.
121 hun-ri-vukqal=1 on the seventh score.
122 cab-ri-vukqal=2 on the seventh score.
123 oxib-ri-vukqal=3 on the seventh score.
So to 139.
140 vuk-qal=7×20.
141 hun-ri-vahxakqal=1 on the eighth score.
142 cab-ri-vahxakqal=2 on the eighth score.
143 oxib-ri-vahxakqal=3 on the eighth score.
160 vahxak-qal=8×20.
161 hun-ri-belehqal=1 on the ninth score.
So to 179.
180 beleh-qal=9×20.
181 hun-r-otuk=1 on the tenth score, or literally 1 on the fifth 40.
So to 199.

Here is a change in the order from *lahuh-qal*, or 10×20, as it would be regularly, to *otuk*, or 5 *tuk*, which seems to give indications of modern influence. Brasseur gives the following explanation: "From the number 180 following they say *hun-rotuk*, 181, 1 toward 200, which is represented by the word *otuk* (this name for 200 is composed of *oo*, 5, and *tuk*, which appears to signify a tuft of a certain herb, which has, independently of its ordinary sense, that of 40. This makes, therefore, for the entire word, 40 multiplied by 5; that is to say, 200)." *Tuc* in Maya signifies as a verb "to count heaps, or by heaps" (Henderson, manuscript dictionary, and Beltran, Arte). The succeeding numbers, as will be seen by the list, follow in the count the regular order, though with abbreviated names.

201 hun-ri-hulah=1 on the eleventh score.
So to 219.

Hulah in this instance stands for *hulahu-qal;* that is, 11×20.

220 hulahu-qal=11×20.
221 hun-ri-cablah=1 on the twelfth score.
So to 239.

Cablah, abbreviation of *cablahuh-qal.*

240 cablahuh-qal=12×20.
241 hun-roxlah=1 on the thirteenth score.
So to 259.

Roxlah, abbreviation of *roxlahuh-qal.*

260 roxlahuh-qal=13×20.

The retention of the *r* here, contrary to the general rule, is without apparent reason unless it be for the sake of euphony. *Oxlahuhqal* would seem to be the proper term, as *oxlahuh* is given for 13, *oxqal* for 60, and *omuch-oxlahuhqal* for 660; however, the name for 300 is *rolahuhqal.*

261 hun-ri-cahlahuhqal=1 on the fourteenth score.
So to 279.
280 cahlahuh-qal=14×20.
281 hun-r-olahuhqal=1 on the fifteenth score.
So to 299.
300 rolahuh-qal=15×20.
301 hun-ri-vaklahuhqal=1 on the sixteenth score.
So to 319.
320 vaklahuh-qal=16×20.
321 hun-ri-vuklahuhqal=1 on the seventeenth score.
So to 339.
340 vuklahuh-qal=17×20.
341 hun-ri-vahxaklahuhqal=1 on the eighteenth score.
So to 359.
360 vahxaklahuh-qal=18×20.

361 hun-ri-belehlahuhqal=1 on the nineteenth score.
So to 379.
380 belehlahuh-qal=19×20.
381 hun-r-omuch=1 on the 400, or 1 on the fifth much.
So to 399.
400 omuch=5×80, or 5×4×20.
401 omuch-hun=400+1. Etc.
500 omuch-oqal=400+100.
600 omuch-otuk=400+200.
700 omuch-olah, or omuch-olahuh-qal=400+15×20.
720 omuch-vaklahuhqal=400+16×20.
780 omuch-belehlahuhqal=400+19×20.

At this point Brasseur remarks: "From here onward they count from 400 to 4,000 with the term *go*, that is to say, 400, in this manner; *cago*, two times four hundred; and they begin to count from 781, *hun-ri-cago*, as if they said, one on (or toward) the eight hundred; *cab-ri-cago*, two on eight hundred."

It would seem, therefore, from this remark, that this change in the count commenced only with the last 20 required to make up the 800. But as soon as the count rose above 800 it was based on the 400 next above, that is to say, the third 400, thus:

801 hun-r-oxogo=1 on the third 400.
840 cavinak-r-oxogo=2×20 on the third 400.
860 oxqal-r-oxogo=3×20 on the third 400.

Brasseur gives as the equivalent of *hun-roxogo* "es decir 399 para 1200." Though the term may indicate a number which is the same as 1200−399, it certainly does not indicate any such process of obtaining this number. The first number expressed is *hun*, or 1, and this is related in some way to 3×400, or, the third 400. Brasseur's explanation is therefore unsatisfactory. The count evidently proceeds in the same way as that of the minor numbers above the second score both in the Maya and Quiche dialects, that is, 1, 2, etc., on the next higher score; here it is on the next higher *go* or 400.

880 humuch-r-oxogo=80 on the third 400.
900 oqal-r-oxogo=5×20 on the third 400.
920 vakqal-r-oxogo=6×20 on the third 400.
940 vukqal-r-oxogo=7×20 on the third 400.
960 vahxakqal-r-oxogo=8×20 on the third 400.
980 belehqal-r-oxogo=9×20 on the third 400.
1,000 otuk-r-oxogo=5×40 on the third 400.
1,200 roxogo=3×400.

Here the prefixed *r* (for *ri*) is retained for no apparent use unless possibly for euphony.

1,600 cahgo=4×400.
2,000 roogo, or rogo=5×400.
2,400 vakago=6×400.
2,800 vukugo=7×400.
3,000 otuk-vahxakgo=5×40 on the eighth 400.

3,200	vahxa-go=8×400.
3,600	beleh-go=9×400.
4,000	lahuh-go=10×400.
4,400	hulahuh-go=11×400.
4,800	cablahuh-go=12×400.
5,000	otuk-oxlahuh-go=200 on the thirteenth 400.
5,200	oxlahuh-go=13×400.
5,600	cahlahuh-go=14×400.
6,000	roolahuh-go=15×400.
6,400	vaklahuh-go=16×400.
6,800	vuklahuh-go=17×400.
7,000	otuk-vahxaklahuh-go=200 on the eighteenth 400.
7,200	vahxak-lahuh-go=18×400.
7,600	belehlahuh-go=19×400.

Upward from this point to 7,999 the count is based on 8,000, for which the word *chuvy*—which, according to Brasseur, denotes the bag or sack containing 8,000 cacao nuts, corresponding exactly with the Mexican *xiquipilli*—was used.

7,601	hun-ri-hu-chuvy=1 on the first 8,000.
7,602	cab-ri-hu-chuvy=2 on the first 8,000, etc.
16,000	ca-chuvy=2×8,000.
24,000	ox-chuvy=3×8,000, etc.
80,000	lahuh-chuvy=10×8,000.
88,000	hulahuh-chuvy=11×8,000.

"Y asi de los demas hasta el infinito" (Brasseur).

In the other dialects of the Mayan family the lists of numerals above 10, so far as obtained, are as follow:

Cakchikel[1]

10	lahuh.
11	huvilahuh[2]=1+10.
12	cablahuh=2+10.
13	oxlahuh=3+10.
14	cahlahuh=4+10.
15	vuolahuh=5+10.
16	vuaklahuh=6+10.
17	vuklahuh=7+10.
18	vuahxaklahuh=8+10.
19	belehlahuh=9+10.
20	huvinak=1 man.

Stoll[3] gives the old and new methods of counting among the Cakchiquels from 40 to 80, as follow (*h* being substituted for *j*); the number equivalents are our additions:

	Old		*New*
40	ca-vinak=2 men	40	ca-vinak=2 men.
41	hun-r-oxc'al=1 on the third score.	41	ca-vinak-hun=2 men and 1, or 2×20+1.
42	cai-r-oxc'al=2 on the third score.	42	ca-vinak-cai=2×20+2.
43	oxi-r-oxc'al=3 on the third score.	43	ca-vinak-oxi=2×20+3.
44	cahi-r-oxc'al=4 on the third score.	44	ca-vinak-cahi=2×20+4.
45	voo-r-oxc'al=5 on the third score.	45	ca-vinak-vuoo=2×20+5.
46	vuakaki-r-oxc'al=6 on the third score.	46	ca-vinak-vuaki=2×20+6.

[1] Stoll, Zur Ethhnog. Guatemala, p. 136.
[2] The *vi* in this name is apparently incorrect; it is possibly a misprint for *n*.
[3] Soc. cit.

	Old		*New*
47	vuku-r-oxc'al=7 on the third score.	47	ca-vinak-vuku=2×20+7.
48	vuakxaki-r-oxc'al=8 on the third score.	48	ca-vinak-vuahxaki=2×20+8.
49	belehe-r-oxc'al=9 on the third score.	49	ca-vinak-belehe=2×20+9.
50	lahuh-r-oxc'al=10 on the third score.	50	ca-vinak-lahuh=2×20+10.
51	hu-lahuh-r-oxc'al=11 on the third score.	51	ca-vinak-huvilahuh=2×20+11.
52	cab-lahuh-r-oxc'al=12 on the third score.	52	ca-vinak-cablahuh=2×20+12.
53	ox-lahuh-r-oxc'al=13 on the third score.	53	ca-vinak-oxlahuh=2×20+13.
54	cah-lahuh-r-oxc'al=14 on the third score.	54	ca-vinak-cahlahuh=2×20+14.
55	vuo-lahuh-r-oxc'al=15 on the third score.	55	ca-vinak-vuolahuh=2×20+15.
56	vuak-lahuh-r-oxc'al=16 on the third score.	56	ca-vinak-vaklahuh=2×20+16.
57	vuk-lahuh-r-oxc'al=17 on the third score.	57	ca-vinak-vuklahuh=2×20+17.
58	vuakxak-lahuh-r-oxc'al=18 on the third score.	58	ca-vinak-vuahxaklahuh=2×20+18.
59	beleh-lahuh-r-oxc'al=19 on the third score.	59	ca-vinak-belehlahuh=2×20+19.
60	oxc'al=3×20.	60	ox-vinak, or oxc'al=3×20.
61	hun-ru-humu'ch=1 on the fourth score.	61	ox-vinak-hun=3×20+1.
80	humu'ch.	80	cah-vinak, or humu'ch=4×20, or 80.

Dr Brinton, in his Grammar of the Cakchiquel Language of Guatemala (page 68), translated from a manuscript in the Library of the American Philosophical Society, gives the following additional numbers, his *q* being changed to *c'* to correspond with Stoll's list:

100	oc'al=5×20.
101	hun-ru-vakc'al=1 on the sixth score.
120	vakc'al=6×20.
121	hun-ru-vukc'al=1 on the seventh score.
140	vukc'al=7×20.
160	vakxak-c'al=8×20.
180	beleh-c'al=9×20.
200	otuc=5×40.
300	volahuh-c'al=15×20.
400	omuch=5×80.
500	omuch-oc'al=5×80+5×20, or 400+100.
600	omuch-otuk=400+200.
700	omuch-volahuh-c'al=400+15×20.
800	cagho=2 gho or 2×400.
900	oxc'al-r-oxogho?

This is a mistake or misprint for

900	oc'al-r-oxogho=100 (or 5×20) on the third 400.
1,000	otuc-r-oxogho=200 (or 5×40) on the third 400.
8,000	hu-chuvy.

The following list of Pokonchi numerals is from Stoll's Maya-Sprachen der Pokom-Gruppe (p. 51):

Pokonchi

10	lahe-b.
11	hun-lah=1+10.
12	cab-lah=2+10.
13	ox-lah=3+10.
14	cah-lah=4+10.
15	ho-lah-uh=5+10.
16	vuak-lah=6+10.
17	vuk-lah=7+10.
18	vuaxak-lah=8+10.
19	beleh-lah=9+10.
20	hun-inak=1×20, or 1 man.
21	hen-ah ru-ca-vuinak=1 on the second score, or on the second 20.
22	quib ru-ca-vuinak=2 on the second score, or on the second 20.
30	laheb ru-ca-vuinak=10 on the second score, or on the second 20.
40	ca-vuinak=2×20.
50	laheb r-oxc'al=10 on the third score.
60	ox-c'al=3×20.
70	laheb ru-cah-vuinak=10 on the fourth score.
80	cah-vuinak=4×20.
100	ho-c'al=5×20.
200	ho-tuc=5×40.

Stoll interprets the *henah ru-ca-vuinak* of the above list by "1 sein 2×20;" that is, 1 of, or belonging to, 2×20 or the second 20. This is exactly the same as saying one on the second score. The *ru* for which "sein" stands is the third person, singular, possessive pronoun, as in *rupat*, "his house."

In Quekchi (or K'ak'chi), from which the next example of numbers above 10 is taken, we follow the "Vocabulario Castellano-K'ak'chi" of Enrique Bourgeois, as published by A. L. Pinart (pp. 7–8), always, however, changing the Spanish *j* to *h*.

K'ak'chi

10	laheb.
11	hun-lahu=1+10.
12	kab-lahu=2+10.
13	ox-lahu=3+10.
14	kabahu, or kaa-lahu=4+10.
15	ho-lahu=5+10
16	guac-lahu=6+10.
17	guk-lahu=7+10.
18	guaxak-lahu=8+10.
19	bele-lahu=9+10.
20	hun-may.

Why *may* or *mai* is used here instead of *kal*, the proper term for 20, is not apparent, as it is a term applied in counting a particular class of objects. Charencey[1] remarks as follows in regard to it:

Ainsi le Cakgi possède au moins cinq termes pour rendre notre nom de nombre 20, suivant les objets auquels il se rapporte. Ainsi, l'on dira *hurinc*, s'il s'agit de compter des graines de cacao ou de pataste (cacao sauvage); *huntaab*, pour les couteaux et instruments de fer ou de métal; *hunyut*, pour les plumes vertes; *húmai*, s'il s'agit

[1] Mélanges, pp. 65–66

de compter les poutres, les bestiaux, les fruits et objets comestibles. De même le Quiché employait cette particule *mai* ou *may*, lorsqu'il s'agissait du comput de l'espace de vingt ans; de *vinak*, alors que l'on voulait supputer les mois, etc.

21 hun-x-kakal=1 on the second score.
22 kaib-x-kakal=2 on the second score.
23 oxib-x-kakal=3 on the second score.
24 kaaib-x-kakal=4 on the second score.
25 hoob-x-kakal=5 on the second score.
26 guakib-x-kakal=6 on the second score.
27 gukub-x-kakal=7 on the second score.
28 guahxakib-x-kakal=8 on the second score.
29 beleb-x-kakal=9 on the second score.
30 laheb-x-kakal=10 on the second score.
31 hun-lahu-x-kakal= 11 (or 1 + 10) on the second score.
32 kab-lahu-x-kakal=12 (or 2+10) on the second score.
33 ox-lahu-x-kakal=13 on the second score.
So to 39.
40 kakal=2×20.
41 hun-r-oxkal=1 on the third score.
42 kaib-r-oxkal=2 on the third score.
So to 49.
50 laheb-r-oxkal=10 on the third score.
51 hun-lahu-r-oxkal =11 (or 1+10) on the third score.
52 kab-lahu-r-oxkal= 12 (or 2+10) on the third score.
So to 59.
60 oxal=3×20.
61 hun-x-kakal?=1 on the fourth score.
62 kaib-x-kakal?=2 on the fourth score.
So to 69.
70 laheb-x-kakal?=10 on the fourth score.
71 hun-lahu-x-kakal?=11 (or 1+10) on the fourth score.
72 kab-lahu-x-kakal?=12 (or 2+10) on the fourth score.
So to 79.

The *kakal* in the last five numerals unquestionably denotes 4×20, or 80, the proper term for which is *kaakal*. As *kakal* is the term for 40, or literally 2×20, there must be either a distinction in the pronunciation not indicated in the vocabulary or an error in the printing. The data at hand do not furnish the means of determining the signification of the inserted *x* as in *hunxkakal;* it seems evident that it plays the same rôle as *r* before *o*, as in *roxkal*.

80 kaakal=4×20.
81 hun-r-okal=1 on the fifth score.
82 kaib-r-okal=2 on the fifth score.
So to 89.
90 laheb-r-okal=10 on the fifth score.
91 hun-lahu-r-okal=11 (or 1+10) on the fifth score.
So to 99.
100 hokal=5×20.
120 guackal=6×20.
200 hotuc=5×40.
400 hun-okob=1×400.
800 kaib-okob=2×400.

The list of numerals above 10 in the Mam dialect given below is from the Arte y Vocabulario en Lengua Mame, by Marcos Salmeron, published by Charencey (page 156).

Mam

10	lahuh.
11	hum-lahuh=1+10.
12	kab-lahuh=2+10.
13	ox-lahuh=3+10.
14	kiah-lahuh=4+10.
15	oo-lahuh=5+10.
16	vuak-lahuh=6+10.
17	vuk-lahuh=7+10.
18	vuahxak-lahuh=8+10.
19	belhuh-lahuh=9+10.
20	vuinkim or huing (Stoll)=1 man.
30	vuinak-lahuh=1 man, or 20+10.
40	ka-vuinak=2×20.
41	hum-t-oxkal-im=1 to the third score.
42	kabe-t-oxkal-im=2 to the third score.
43	oxe-t-oxkal-im=3 to the third score.
44	kiah-t-oxkal-im=4 to the third score.
45	hoe-t-oxkal-im=5 to the third score.
46	vuakak-t-oxkal-im=6 to the third score.
47	vuk-t-oxkal-im=7 to the third score.
48	vuahxak-t-oxkal-im=8 to the third score.
49	velhuh-t-oxkal-im=9 to the third score.
50	lahuh-t-oxkal-im=10 to the third score.
60	ox-kal=3×20.
70	lahuh-tu-hu-much-im=10 on the fourth score.
80	hum-mucx=1 much, or 1×80.
90	lahuh-t-okal-im=10 on the fifth score.[1]
100	okal=5×20.
200	ochuk=5×40.
300	oloh-kal=15×20.
400	o-mucx=5×80.
500	omucx-okal=400+100, lit. (5×80)+(5×20).
600	omucx-ochuh=400+200, lit. (5×80)+(5×40).
700	omucx-oloh-kal=400+300, lit. (5×80)+(15×20).
900	lahuh-tuki-okal.

Stoll[2] gives a method of counting above 40 in this idiom so different from that presented above that his brief notice is presented here:

40	caunak=2×20 ?, or 2 men.
50	caunak-t-iqui-lahoh=40+10.
60	ox-c'al=3×20.
70	ox-c'al-t-iqui-lahoh=60+10.
80	hu-much=1×80.
90	hu-much-t-iqui-lahoh=80+10.

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[1] Salmeson gives *t-oxkal*, which is an evident error.
[2] Sprache der Ixil-Indianer, p. 146.

This, as will be seen, adds to the preceding 20 instead of counting on the following 20, and is presumed to indicate the more modern method of counting.

Ixil[1]

10	la-vual.
11	hun-lavual=1+10.
12	cab-lavual=2+10.
13	ox-lavual=3+10.
14	ca-lavual=4+10.
15	o-lavual=5+10.
16	vuah-lavual=6+10.
17	vuh-lavual=7+10.
18	vuaxah-lavual=8+10.
19	bele-lavual=9+10.
20	vuink-il, or vuinquil.
21	vuinah-un-ul=20+1.
22	vuinah-cab-il=20+2.
23	vuinah-ox-ol=20+3.
24	vuinah-cāl=20+4 (cal for cah-il).
25	vuinah-ōl=20+5 (ol for o-ol).
26	vuinah-vuah-il=20+6.
27	vuinah-vuh-ul=20+7.
28	vuinah-vuaxah-il=20+8.
29	vuinah-belu-vual=20+9.
30	vuinah-lavual=20+10.
40	ca-vuink-il=2×20.
60	ox-c'al-al=3×20.
70	lavual-i-much=10 on the 80.
80	ung-much-ul=ome much, or one 80.
90	lavual-t-oc'al=10 on the fifth score.
100	o-c'al-al=5×20.
101	oc'alal-t-uc-ungvual=100+1.
110	lavual-i-vuahc'al=10 on the sixth score.
120	vuah-c'al-al=6×20.[2]
130	lavual-i-vuhc'al=10 on the seventh score.
140	vuh-c'al-al=7×20.
150	lavual-i-vuaxahc'al=10 on the eighth score.
160	vuaxah-c'al-al=8×20.
170	lavual-i-belec'al=10 on the ninth score.
180	bele-c'al-al=9×20.
190	lavual-i-lac'al=10 on the tenth score.
200	la-c'al-al=10×20 (or cavual-ciento=2×100—Spanish).
220	hunla-c'al-al=11×20.
230	lavual-i-cabla-c'al=10 on the twelfth score.
240	cabla-c'al-al=12×20.
260	oxla-n-c'al-al=13×20 (same as oxlahunc'alal).
280	cala-n-c'al-al=14×20.
300	ola-n-c'al-al=15×20.

[1] Stoll, op. cit., pp. 50–52.
[2] Stoll gives by slip of the pen "4×20."

320 vuahla-n-c'al-al=16×20.
340 vuhla-n-c'al-al=17×20.
360 vuaxahla-n-c'al-al=18×20.
380 belela-n-c'al-al=19×20.
400 vuinkil-an-c'al-al=20×20.
420 vuinah-un-ul-an-c'al-al=(20+1)×20.
440 vuinah-ca-vual-an-c'al-al=(20+2)×20.
460 vuinah-ox-l-an-c'al-al=(20+3)×20.
480 vuinah-ca-l-an-c'al-al=(20+4)×20.
500 vuinah-o-l-an-c'al-al=(20+5)×20.
520 vuinah-vuah-il-an-c'al-al=(20+6)×20.
540 vuinah-vuh-l-an-c'al-al=(20+7)×20.
560 vuinah-vuaxah-il-an-c'al-al=(20+8)×20.
580 vuinah-bele-l-an-c'al-al=(20+9)×20.
600 vuinah-la-vual-an-c'al-al=(20+10)×20.
620 vuinah-hun-la-vual-an-c'al-al=(20+1+10)×20.
640 vuinah-cab-la-vual-an-c'al-al=(20+2+10)×20.
660 vuinah-ox-la-vual-an-c'al-al=(20+3+10)×20.
680 vuinah-ca-la-vual-an-c'al-al=(20+4+10)×20.
700 vuinah-o-la-vual-an-c'al-al=(20+5+10)×20.
720 vuinah-vuah-la-vual-an-c'al-al=(20+6+10)×20.
740 vuinah-vuh-la-vual-an-c'al-al=(20+7+10)×20.
760 vuinah-vuaxah-la-vual-an-c'al-al=(20+8+10)×20.
780 vuinah-bele-la-vual-an-c'al-al=(20+9+10)×20.
800 ca-vuinkil-an-c'al-al=(2×20)×20.

Aguacateca[1]		Jacalteca[1]		Chuhe[1]	
10	lahu	10	lahuneb	10	lahne
11	hunla	11	hun-lahuneb	11	uxlche (?)
12	cabla	12	cab-lahuneb	12	lahchue (?)
13	oxla	13	ox-lahuneb	13	ux-lahne
14	quayahla	14	can-lahuneb	14	chanlahne
15	ola	15	ho-lahuneb	15	holahne
16	vuakla	16	vuah-lahuneb	16	vuaklahne
17	vukla	17	vuh-lahuneb	17	uklahne
18	vuahxakla	18	vuahax-lahuneb	18	vuaxlahne
19	belela	19	balun-lahuneb	19	banlahne
20	hunak	20	hun-c'al	20	hun-c'al
21	hunak-hun	21	hun-es-cavuinah	40	chavuinal
22	hunak-cab	30	lahun-s-cavuinah	60	hoix-vuinak (?)
23	hunak-ox	40	ca-vuinah		
40	caunak	60	ox-c'al		
60	ox-c'al	100	ho-c'al		
80	hun-much				

[1] Stoll, Sprache der Ixil-Indianer, p. 146.

Tzotzil (a)		Chanabal (a)		Chol (b)	
10	lahunem	10	lahuné	10	lahum
11	buluchim	11	buluché, or baluche	11	humpé e luhumpé=1+10
12	lah-chaém=10+2	12	lah-chane (c)=10+2	12	chapé e luhumpé=2+10
13	ox-lahuném=3+10	13	ox-lahuné=3+10	13	uxpé e luhumpé=3+10
14	chan-lahuném=4+10	14	chan-lahuné=4+10	14	chumpé e luhumpé=4+10
15	ho-lahuném=5+10	15	ho-lahuné=5+10	15	ho-lumpé=5+10 [ho e luhumpé]
16	uak-lahuném=6+10	16	uak-lahuné=6+10	16	uokpé e luhumpé=6+10
17	vuk-lahuném=7+10	17	huk-lahuné=7+10	17	hukpé e luhumpé=7+10
18	uaxak-lahuném=8+10	18	uaxak-lahuné=8+10	18	uaxokpé e luhumpé=8+10
19	balum-lahuném=9+10	19	bala-hune=9+10	19	bolompé e luhumpé=9+10
20	tom	20	huntahbe	20	hun-c'al=one 20
40	cha-vuinik=2×20, or 2 men	40	cha-vuiniké=2×20, or 2 men	40	cha-c'al=2×20
60	ox-vuinik=3×20	60	ox-vuiniké=3×20	60	ux-c'al=3×20
80	chan-vuinik=4×20	80	chan-vuiniké=4×20	80	chun-c'al=4×20
100	ho-vuinik=5×20	100	ho-vuiniké=5×20	100	hoo-c'al=5×20

a Stoll, Ethnog. Guatemala, pp. 69–70.
b Stoll, op. cit.
c Should not this be *lah-chabe?*

Mixe [1]

10 mahc.
11 mahc-tuuc=10+1.
12 mahc-metzc=10+2.
13 mahc-tucôc=10+3.
14 mahc-mactz=10+4.
15 mahc-mocx=10+5.
16 mahc-tuduuc=10+6 or mahc-mocx-tuuc=10+5+1.
17 mahc-huextuuc=10+7 or mahc-mocx-metzc=10+5+2.
18 mahc-tuctuuc=10+8 or mahc-mocx-tucoc=10+5+3.
19 mahc-taxtuuc=10+9 or atuuc câ ypx=1 from 20 or one more to 20.
20 ypx.
21 ypx-tuuc=20+1.
22 ypx-metzc=20+2.
23 ypx-tucôc=20+3.

[1] Raoul de la Grassèrie, Langue Zoque et Langue Mixe, 332, 333.

24	ypx-maxtaxc=20+4.
25	ypx-mocoxc=20+5.
26	ypx-tuduuc=20+6 (literally 20+5+1).
27	ypx-huextuuc=20+7 (literally 20+5+2).
28	ypx-tuctuuc=20+8 (literally 20+5+3).
29	ypx-taxtuuc=20+9 or atuuc ca ypxmahc=1 from 30 or 1 more to 30.
30	ypx-mahc=20+10.
31	ypx-mahc-tuuc=20+10+1.
32	ypx-mahc-metzc=20+10+2.
33	ypx-mahc-tucôc=20+10+3.
40	huixticx (?) [metz-ipx?]
60	tucô-px=3×20.
80	mohcta-px=4×20.
100	mocô-px=5×20.
120	tuduu-px=6×20.
140	huextuut=7×20 ?
160	tuctuut=8×20 ?
180	taxtuut=9×20 ?
200	maiqu-ipx=10×20.
300	yucmocx=20×15 ?
400	tuuc-moiñ=1 moin.
500	tuuc-moiñ co mocopx=400+100 or 400+5×20.
600	tuuc-moiñ co maiquipx=400+200 or 400+10×20.
700	tuuc-moiñ co yucmocx=400+300.
800	metzc-moiñ=2×400.
900	metzc-moiñ co mocopx=2×400+100.
1,000	metzc-moiñ co maiquipx=2×400+200.

Zoque [1]

1		2	
10	makch-kan	10	macay
11	makch-tuman=10+1	11	(?)
12	makch-kues teut-kan	12	macueste-cuy
13	(?)	13	mac-tucay=10+3
20	i-itpshan	20	ips-vote, yps-vote, or yps-vate (literally yps or ips=20)
30	i-ips-comak-kan	30	yps co mac=20+10
40	wûeus-tu-gi-ipshan	100	mos-ips=5×20
50	wûeus-tu-gi-comak-kan=40+10	300	yet-ips
60	tugi-ipshan=3×20	2,000	mosmone
70	tugips-comak-kan=60+10	10,000	tzuno-comos-mone
80	mak-tapshan=4×20	12,000	tzuno-comac-mona
90	mak-tapshan-coma-kan=80+10	13,000	tzuno-coma, vestec-mone
100	mossiipshan=5×20	16,000	vestec-tzunu
200	magi-ipshan=10×20	20,000	vestectzuno-comac-mone
		30,000	tucuy-chuno coyet-mone
		300,000	yps-coyu covestec-tzuno

[1]This list of numerals must be accepted with some reserve; it is partly (1) from E. A. Fuertes' manuscript in the Bureau of American Ethnology archives and partly (2) from the Vocabulary in Grasserie's Langue Zoque.

Trike[1]

10 chia.
11 châ-nha=10+1.
12 chu-úiha=10+2.
13 cha-nûnha=10+3.
14 chi-gâha=10+4.
15 chinôônha=15×1?
16 chinônhi-ha=15+1.
17 chinôn-huiha=15+2.
18 chinôn-guanônha=15+3.
19 chinôn-gaha=15+4.
20 hikoo or kooha.
21 hikoo-ñia-nha=20+1.
22 hikoo-ghuiha=20+2.
30 hikoo-chiha=20+10.
31 hikoo-chân=20+11 (literally 20+10+1.
32 hikoo-chuuiha=20+12 (literally 20+10+2).
33 ikoo-chanûnha=20+13 (literally 20+10+3.)
40 ghuixiaâha=2×20?
41 ghuixiaâ-ngoha=40+1.
42 ghuixiaâ-ghuiha=40+2.
50 ghuixiaâ-chiha=40+10.
51 ghuixiaâ-chanha=40+11 (literally 40+10+1).
52 ghuixiaâ-chuuiha=40+12 (literally 40+10+2).
60 guanônxiaha=3×20?
61 guanonxia-ñia-nha=60+1.
62 guanônxia-ghuiha=60+2.
70 guanônxia-chiha=60+10.
71 guanônxia-chiñia-nha=60+10+1.
80 kâaxihaa=4×20?
81 kâaxia-ngoha=80+1.
90 kâaxia-chiha=80+10.
91 kâaxia-chân=80+11 (literally 80+10+1).
100 hûhû-chia=5×20.

The *xiaâ* in the names for 40, etc., appears to be an equivalent of 20.

Cahita[2]

10 uo-mamni=2×5.
11 uomamni aman-senu=10+1 or 2×5+1. Also, uomamni ama vepa-senu.
20 senu-tacaua=one 20 or 1×20.
40 uoi-tacaua=2×20.
60 vahi-tacaua=3×20.
80 naequi-tacaua=4×20.
100 mamni-tacaua=5×20.
200 uo-mamni-tacaua=10×20 (literally 2×5×20).
400 uo-mamni uosa-tacaua=(2×5)×(2×20)?
500 uo-mamni uosa aman mamni-tacaua=400+100.
600 uo-mamni aman vahi-si-tacaua=(2×5)×(3×20)
700 uo-mamni vahi-si aman mamni-tacaua=600+100.
800 uo-mamni naequi-si-tacaua=(2×5)×(4×20).
900 uo-mamni naequi-si aman mamni-tacaua=800+100.
1,000 uo-mamni mamni-si-tacaua=(2×5)×(5×20).
4,000 naequi uonmamni mamnistacaua.

The author adds the following paragraphs:

Some nations [?] say *senutacaua* or *sesavehere* for 20, others say *sesavehere* for 10, and follow up the count thus, 11 *sesavehere aman senu*, 12 *sesavehere aman uoi*, etc.; for 20 they say *uosavehere*, which is 2 times 10.

[1] Francisco Belmar, Ensayo sobre Lengua Trike, p. 10.
[2] Arte Lengua Cahita (anon.), edited by Eustaquio Buelna, pp. 199, 200.

The Yaquis say for 5 *sesavehere*, and counting from 5 to 5 [more] say *uosavehere* 10, *vahivehere* 15; these also say for 20 *senutacaua* or *naequivehere*, and for 25 say *sesavehere*, and for 100 say *mamnitacaua* or *tacauavehere*, which is 20 fives.

He explains the "numeral adverbs" *sesa* and *uosa* thus: *se-sa*, "one time," *uo-sa*, "two times;" for example, *sesavehere*, one time 5, *uoivehere*, two times 5, etc.

Othomi[1]

10	réta or rāta.	30	n-ráhte-ma-réta=20+10.
11	réta-ma-ra=10+1.	40	yohte=2×20.
12	réta-ma-yooho=10+2.	50	n-yohte-ma-réta=40+10.
13	réta-ma-hiu[2]=10+3.	60	hiû-ráhte=3×20.
14	réta-ma-gooho=10+4.	70	hiûráhte-ma-réta=60+10 (literally 3×20+10).
15	réta-ma-qyta=10+5.	80	gooho-ráhte=4×20.
16	réta-ma-rahto=10+6.	90	gooho - ráhte - ma[3] - réta=80+10 (literally 4×20+10).
17	réta-ma-yohto=10+7.	100	n-ranthbe, or n-ranéhbe.
18	réta-ma-hiâhto=10+8.	1,000	n-ram-oo.
19	réta-ma-gyhto=10+9.		
20	n-ráhte.		

Tarasco[4]

10	temben.
11	temben-ma=10+1.
12	temben-tziman=10+2.
13	temben-tanimu=10+3.
14	temben-thamu=10+4.
15	temben-yumu=10+5.
16	temben-cuimu=10+6.
17	temben-yuntziman=10+7.
18	temben-yuntanimu=10+8.
19	temben-yunthamu=10+9.
20	maequatze or makatari.
30	maequatze ca-temben=20+10.
40	tziman-equatze=2×20.
50	tziman-equatze ca-temben=40+10 (literally 2×20+10).
60	tanime-equatze=3×20.
70	tanimequatze ca-temben=60+10.
80	thamequatze=4×20.
90	thamequatze ca-temben=80+10.
100	yumequatze=5×20.
200	temben-equatze=10×20.
300	temben-equatze ca yumequatze=200+100 (literally, 10×20+5×20).
400	ma-yrepeta=1×400.
500	ma-yrepeta ca-yum-equatze=400+100.
600	ma-yrepeta ca-temben equatze=400+200 (literally, 400+10×20).
700	ma-yrepeta ca-temben yumequatze=400+300, or in full, mayrepeta ca-temben-equatze yumequatze=400+10×20+5×20.
800	tziman yrepeta=2×400.
900	tziman yrepeta ca-yumequatze=800+100 (literally 2×400+5×20).
1,000	tziman yrepeta ca-temben-equatze = 800 + 200 (literally, 2×400+10×20).

[1] Luis de Neve Ymolina, Arte del Idioma Othomi, pp. 152, 153, and Éléments de la Grammaire Othomi (anon.), p. 14.

[2] *htu* in Ymolina's Arte (probably a misprint).

[3] *mo* in Arte.

[4] Arte y Diccionario Tarascos, by Juan Bautista de Laguna, edited by Nicholas Léon, pp. 59–61.

2,000	yum-yrepeta $=5\times400$.
3,000	yun-tziman yrepeta ca-temben-equatze $=7\times400+10\times20$.
4,000	temben yrepeta $=10\times400$.
5,000	temben-tziman yrepeta ca-temben equatze $=12\times400+10\times20$.
6,000	temben yum-yrepeta $=10\times400+5\times400$ (written in full, temben yrepeta ca-yum-yrepeta.)
7,000	temben yuntziman yrepeta ca-temben equatze $=17\times400+10\times20$. (literally, $(10+7)\times400+10\times20$).
8,000	ma-equatze yrepeta $=20\times400$.
9,000	ma-equatze tziman yrepeta ca-temben equatze $=(20+2)\times400+10\times20$.
10,000	ma-equatze yum yrepeta $=8{,}000+200$ (literally, ma-equatze yrepeta ca-yum yrepeta $=20\times400+5\times400$).
20,000	tziman equatze yrepeta ca-temben yrepeta $=2\times20\times400+10\times400$.
30,000	tanim equatze temben yrepeta cayum yrepeta $=70\times400+2{,}000$ (literally, $(3\times20+10)\times400+5\times400$).
40,000	yum-equatze yrepeta $=5\times20\times400$.
50,000	cuim-equatze yrepeta ca-yum-yrepeta $=6\times20\times400+5\times400$.
60,000	yun-tanim-equatze yrepeta(?) =?.
70,000	yun-tham-equatze yrepeta ca-yum-yrepeta(?) =?.
80,000	temben-equatze yrepeta, ca-temben-yrepeta $=10\times20\times400$ ("ca-temben yrepeta" surplusage?).
90,000	temben ma-equatze yrepeta, ca-temben yum yrepeta.
100,000	temben-tanim-equatze yrepeta(?) =?.
200,000	makararhi-equatze yrepeta ca-cuim-equatze yrepeta =?.
300,000	makatarhi-equatze ca-temben yuntham-equatze yrepeta =?.
400,000	tziman katarhi equatze ca-yuntanim equatze yrepeta =?.
500,000	tanim katarhi-equatze ca-tziman equatze yrepeta =?.
600,000	tanim katarhi-equatze catemben yum-equatze yrepeta =?.
700,000	tham-katarhi-equatze ca-yuntanim-equatze yrepeta =?.
800,000	yun-katarhi-equatze ca-ma-equatze yrepeta =?.
900,000	yum-katarhi-equatze ca-temben-tham-equatze yrepeta =?.

There appear to be several errors in this list which can not be corrected with satisfactory certainty without a somewhat thorough knowledge of the language. The name for 60,000 as it stands in the list is equal to $8\times20\times400$, giving as the product 64,000. It is possible that this is the number intended. The proper expression for 60,000 appears to be *yun-tziman-equatze-yrepeta temben-yrepeta* $=7\times20\times400+10\times400$. The name for 70,000 as it stands in the list signifies $9\times20\times400+5\times400=74{,}000$. As it is not probable that this is the number intended, the error must be in the name. If we write *yun-tanim-equatze yrepeta* $=64{,}000$ and add *temben yum-yrepeta*, the abbreviated name for 6,000, we shall get the required number, but the positive evidence that this form is correct is lacking. We observe that the first terms in the names for 10,000, for 20,000, for 30,000, and for 40,000 are, respectively, *ma*, 1; *tziman*, 2; *tanim*, 3; and *yum*, 5. Following this rule, the corresponding terms in the names for 50,000, 60,000, 70,000, and 80,000 should be *cuim*, 6; *yun-tziman*, 7; *yuntanim*, 8; and *temben*, 10. The corrections suggested for 60,000 and 70,000 (as 80,000 has *temben*) will conform to this order. These high round numbers have, however, a modern look inconsistent with original Mexican number systems.

Opata[1]

10	makoi.
11	makoi-seni-beguâ[2]=10+1.
12	makoi-go-beguâ=10+2.
13	makoi-ba-beguâ=10+3.
14	makoi-nago-beguâ=10+4.
15	makoi-mari-beguâ=10+5.
16	makoi-bussani-beguâ=10+6.
17	makoi-seni-gua-bussani-beguâ=10+7 (literally 10+1+6).
18	makoi-go-nago-beguâ=10+8 (literally 10+2×4).
19	kiseuri=before or next to 20.
20	seuri, or seneurini=1 man (?).
21	seuri-seni-beguâ=20+1.
30	seuri-makoi-beguâ=20+10.
40	gode-urini=2×20.
50	godeurini makoi-begua=40+10 (literally 2×20+10).
60	vaide-urini=3×20.
100	makoi-urini? (error; should be mari-urini=5×20?).

Tarahumari[3]

10	macoi-qui.
11	macoi-guamina-bire=10+1.
12	macoi-guamina-oca=10+2.
13	macoi-guamina-beiquia=10+3.
	So to 19.
20	osa-macoi=2×10.
30	beisa-macoi=3×10.
40	naguosa-macoi=4×10.

Notwithstanding the evident resemblance of the numerals of this idiom up to 10 to those of the Nahuatl, it is clear from this short list, which is all we are enabled to offer from the data at hand, that the higher number names are based on the decimal system.

As the mode of counting used by the tribes of the Shoshonean group, so far as they have been obtained, is based on the decimal system, it is unnecessary to present more than one or two examples, which will be introduced farther on.

Before closing this chapter a few other examples, including two from northeastern Asia, will be presented for comparison. The first of these is the Totonacan count above 10. Unfortunately we have only the round numbers.

Totonaca[4]

10	cauh.
20	puxam.
30	puxam-a-cauh=20+10.
40	ti-puxam=2×20.
50	ti-puxam-a-cauh=2×20+10.
60	toton-puxam=3×20.
100	quitziz-puxam=5×20.
200	co-puxam=10×20.
400	tontaman.
1,000	ti-taman-a-co-puxam=2×400+10×20.

[1] This incomplete list is gathered from the Vocabulario Opata in Pimentel's Cuadro, vol. II.
[2] The signification of *beguâ* in this connection unknown to the writer.
[3] Miguel Tellechea, Compendio Grammatical Idioma Tarahumari, p. 7.
[4] Conant, Number Concept, p. 205.

For numbers in a different dialect see Akal'man in the preceding chapter.

Squier[1] gives the numerals of a Nicaraguan tribe that he names Nagranda (Subtiabanss?), which show that the system was regularly vigesimal.

Nagranda

10	Guha=10.	41	Apudiñoimbanu=2×20+1.
11	Guanimba=10+1.	42	Apudiñoapunu=2×20+2.
12	Guanapu=10+2.	43	Apudiñoasunu=2×20+3.
13	Guanasu=10+3.	50	Apudiñoguhanu=2×20+10.
14	Guaracu=10+4.	51	Apudiñoguanimbanu=2×20+1.
15	Guanisu=10+5.	52	Apudiñoguanapunu=2×20+10+2.
16	Guanmahu=10+6.	60	Asudiño=3×20.
17	Guanquinu=10+7.	70	Asudiñoguhanu=3×20+10.
18	Guanuha=10+8.	80	Acudiño=4×20.
19	Guanmelnu=10+9.	90	Acudiñoguhanu=4×20+10.
20	Dino, imbadiño, or 'badiño=1×20.	100	Huisudiño or guhamba=5×20 or great ten.
21	'Badiñoimbanu=1×20+1.	200	Guahadiño=10×20.
22	'Badiñoapunu=1×20+2.	400	Diñoamba=great twenty.
23	'Badiñoasunu=1×20+3.	1000	Guhaisudiño=10×5×20.
30	'Badiñoguhanu=1×20+10.	2000	Hisudiñoamba=five great twenties.
31	'Badiñoguanimbanu=1×20+10+1.	4000	Guhadiñoamba=ten great twenties.
32	'Badiñoguanapunu=1×20+10+2.		
33	'Badiñoguanasunu=1×20+10+3.		
40	Apudiño=2×20.		

As we shall have occasion to refer to one example from a California dialect not pertaining to the Uto-Aztecan family, we give it here.

Hūchnōm[2]

1	pu-weh.	20	pu-al-yek.
2	opeh.	30	mis-u-o-pal-yuh=(10 on second score)?
3	mol-meh.	40	o-pal-yuh=2×20.
4	ke-so-peh.	50	mis-u-mol-mal-yuh=(10 on third score)?
5	pu-pukh.	60	mol-mal-yuh=3×20.
6	pu-i-tal=(1+5)?	70	mis-u-kas-a-pal-yuh=(10 on fourth score)?
7	o-pi-dun=(2+5)?	80	kas-a-pal-yuh=4×20.
8	ken-uh-sol-mi-nun.	90	mus-u-pu-al=(10 on fifth score)?
9	hel-pi-suh-pu-tul=(10−1)?	100	pu-ol.
10	hel-pis-oh.		
11	hel-pis-i-pu-tek=10+1.		
12	hel-pis-o-o-po-tek=10+2.		

The number equivalents which we have added are given merely as suggestions. Those for 30, 50, 70, and 90 should possibly be 10 from 40, 10 from 60, etc. We can only say that the equivalent, though possibly not the signification of *mis-u*, must be 10, and that the count relates to the next higher score.

[1] Nicaragua, vol. II, p. 326.
[2] Compar. Vocabularies, by J. W. Powell, in Contrib. to N. Am. Ethn., vol. III, pp. 487, 488.

The two Asiatic examples are the Tschukschi and the Aino.

Tschukschi[1]

10	migitken=both hands.
20	chlik-kin=a whole man.
30	chlikkin mingitkin parol=20+10.
40	nirach chlikkin=2×20.
100	milin chlikkin=5×20.
200	mingit chlikkin=10×20, i. e., 10 men.
1,000	miligen chlin-chlikkin=5×200, i. e., five (times) 10 men.

Aino[2]

10	wambi.
20	choz.
30	wambi i-doehoz=10 from 40, or 10 on the second score.
40	tochoz=2×20.
50	wambi i-richoz=10 from 60, or 10 on the third score.
60	rechoz=3×20.
70	wambi [i?] inichoz=10 from 80, or 10 on the fourth score.
80	inichoz=4×20.
90	wambi aschikinichoz=10 from 100, or 10 on the fifth score.
100	aschikinichoz=5×20.
110	wambi juwanochoz=10 from 120?
120	juwano choz=6×20.
130	wambi aruwanochoz=10 from 140?
140	aruwano choz=7×20.
150	wambi tubischano choz=10 from 160?
160	tubischano choz=8×20.
170	wambi schnebischano choz=10 from 180?
180	schnebischano choz=9×20.
190	wambi schnewano choz=10 from 200?
200	schnewano choz=10×20.
300	aschikinichoz i gaschima chnewano choz=5×20+10×20.
400	toschnewano choz=2×(10×20).
500	aschikinichoz i gaschima toschnewano choz=100+400.

Miscellaneous Lists.

The following lists are added here chiefly as a means of comparison. Some of them have not as yet been satisfactorily classified by linguistic affinity. One or two of the dialects belong to that part of South America near the Isthmus of Panama, but are given because it appears that the tribes speaking them used the "native calendar." The localities where they are spoken are given in connection with the names of the dialects.

[1] Conant, Number Concept, p. 191. [2] Ibid, pp. 191-192.

Moreno (Honduras)[1]

The number names in this dialect present a curious admixture of Moreno and Spanish.

1	aba.	11	uns (Sp.).
2	biama.	12	dus (Sp.).
3	irua.	13	tres (Sp.).
4	gadri.	16	seis (Sp.).
5	senc (Sp.).	20	ven (Sp.).
6	sis (Sp.).	30	drandi (Sp.).
7	set (Sp.).	40	biaven=2×20.
8	vit.	50	biavendis=2×20+10.
9	nef (Sp.).	100	san (Sp.).
10	dis (Sp.).	300	iruasan=3×100.

For the purpose of showing the evident relation of the Moreno number names to those of the Carib group, those of the latter up to 5 are added here, from Rafael Celedon's Gramática Catecismo i Vocabulario de la Lengua Goajira (p. 29). I am not aware to what Carib dialect these belong, as this is not stated by Uricoechea, who wrote the introduction in which they are given—probably to that of the Magdalen district west of lake Maracaibo.

Carib

1 abana.
2 biama.
3 irhua, or eleua.
4 biamburi.
5 nacobo-aparcu, or abana-huajap (one hand).

Sumo (Honduras)[2]

1	as.	8	tiascobas=(5+3?).
2	buu′.	9	tiascarunca=(5+4?).
3	baas=(2+1?).	10	salap.
4	arunca.	12	salap-nica-buu′=10+2.
5	cinca (Sp.).	20	muiaslie.
6	tiascuas=(5+1?).	30	muyasloimincosala=20+10.
7	tiaseabo=(5+2?).	40	muyas-leibu=20x2.

The author gives the names for 50, 60, 70, 80, 100, and 1,000 as follows:

cincuenta.	muy-as leibas.
sesenta.	muy-as leiarunca.
setenta.	muy-as leisinca ("sinca" Sp.).
ochenta.	muy-as leitiascobas.
cien.	muy-as leiarunca.
mil.	muy-as leisala.

[1] Alberto Membreño, Hondureñismos, p. 200.
[2] Ibid., pp. 223-224.

These are clearly erroneous. We venture to correct them so far as possible as follows:

50	muyas leibu-mincosala?=40+10.
60	muyas leibas=20×3.
70	muyas leibas-mincosala?=60+10.
80	muyas leiarunca=20×4.
100	muyas leisinca=20×5.
1,000	(muyas leisala may possibly be an abbreviation for muyas leisinca sala=100×10).

Sumo (Nicaragua)[1]

1	asla.	13	salapminitcobas=10+3.
2	bo.	14	salapminitcoarunca=10+4.
3	bas.	15	salapminitcocinca=10+5.
4	arunca.	16	salapminitcotisaguas=10+5+1.
5	cinca (Sp.).	17	salapminitcotiascobo=10+5+2.
6	tiascoguas=5+1.	18	salapminitcotiascobas=10+5+3.
7	tiascobo=5+2.	19	salapminitcotiascoarunca=10+5×4.
8	tiascobas=5+3.	20	müyaslüy.
9	tiascoarunca=5+4.	30	müyaslüyminitcoslap=20×10.
10	salap.	40	müyaslüyminitcobo=20×2.
11	salapminitcoguas=10+1,	100	müyaslüyminitcocinca=20×5.
12	salapminitcobo=10+2.		

Paya (Honduras)[2]

1	as.	8	oguag.
2	poc.	9	tais.
3	maig.	10	uca.
4	ca.	12	ucarapoc=10+2.
5	aunqui (sp.?).	20	wauca.
6	sera.	100	ispoc.?
7	taoag.	1,000	arcapissas.

Jicaque de Yoro (Honduras)[3]

1	pani.	5	comasopeni.
2	mata.	10	comaspu.
3	condo.	11	quesambopani=10+1.
4	diurupana.	12	quesambobomata=10+2.

Jicaque del Palmar (Honduras)[3]

1	pfani.	6	peve-dro.
2	pmata.	7	ashafaffani=6+1?.
3	abrucua.	8	ashafamata=6+2.
4	urubana.	9	ashafaabruca=6+3.
5	pevebane.	10	commeavu.

Guajiquiro (Honduras)[4]

1	eto.	7	pela sai=2+5.
2	pee.	8	lagua sai=3+5.
3	lagua.	9	erio sai=4+5.
4	erio.	10	ishish lo sai=(2×5?).
5	sai.	11	ishish eta sai=10+1.
6	eta sai=1+5.		

[1] Alberto Membreño, Hondureñismos, p. 223. [2] Ibid., p. 231. [3] Ibid., p. 239. [4] Ibid., p. 248.

Similaton (*Honduras*)[1]

1	eta.	4	herea.
2	pe.	5	say.
3	lagua.	6	issis (doubtful, 10?).

Guaymi (*Veraguas*)[2]

1 crada (krati).
2 crobu.
3 cromo.
4 crobogo (kroboko).
5 coirigue (krorigue).
6 croti.
7 crocugu.
8 crocuo.
9 croegon (krohonkoñ).
10 crojoto.
11 crododi-cradi=10+1 (krojoto ti krati).
12 crododi-crobu=10+2 (krojoto ti krobu).
13 crododi-cromo=10+3.
14 crododi-crobogo=10+4.
20 gre.
21 grebbi-cradi=20+1.
30 grebbi-crojoto=20+10 (grebi-krojoto).
31 grebbi-crojoto-dicradi=20+10+1.
40 gregueddabu=20×2 (gregue krobu).
41 gregueddabu-dicradi=40+1.
50 gregueddabu-dicrojoto=40+10 (gregue krobu ti krojoto).
60 greguedamo=20×3 (gregue kromo).
70 greguedamo-dicrojoto=60+10 (gregue kromo ti krojoto).
80 gregueddabugo=20×4 (gregue kroboko).
90 gregueddabugo-dicrojoto=80+10 (gregue kroboko ti krojoto).
100 greguetariguie=20×5 (gregue krorigue).

Guaymi Sabanero (*Panama*)[3]

1 gdaite.
2 gdabogue or gdabu.
3 gdamai.
4 gdabaga or gdatare.
5 datiga or gdabaga.
6 gdaderegue or gdabo.
7 gdadugue or gdain.
8 gdaapa or gdatiga.
9 gdaica or gdatadi.
10 gdataboco=5×2 or gdatabu.
Count from 10 to 19 by adding 1, 2, etc., to 10.
20 giriete.
21 giriete-gdaite=20+1.
30 guiriete-gdataboco=20+10 (girite?).

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[1] Alberto Membreño, Hondureñismos, p. 256.

[2] A. L. Pinart, Colección de Lingüística y Etnografía Americanas, tomo IV, p. 23. The words in parentheses are from Pinart's Vocabulario Castellano-Guaymie, appendix, p. 5.

[3] A. L. Pinart, Coll. Ling. y Etnog. Am. tomo IV, pp. 52-53, and Vocabulario Castellano-Guaymie, Murire dialect, p. 48.

40	guiribogue=20×2 (giribogue?).
50	guiribogue-gdataboco=40+10.
60	girimai=20×3.
70	girimai-gdataboco=60+10.
80	giribaga=20×4.
90	giribaga-gdataboco=80+10.
100	giritiga=20×5.

Dorasque (*Panama*)[1]

1	que.	5	calamale.
2	como.	6	catacale.
3	calabach.	7	catacalobo.
4	calacapa (calapaca?).		

Other lists with dialectic variations are as follow:[2]

1	kue, umai.	6	kulpaka, katakala.
2	kumat, komo, umaidos.	7	katakalobo.
3	kumas, kalabac, umaitres.	10	kulmalmuk.
4	kupaki, kalapaka.	20	sermalmuk.
5	kulmale.		

Cuna (*Panama*)[3]

1	cuenchique.	12	ambegui caca pocua=10+2.
2	pocua.	20	tulabuena.
3	pagua.	30	tulabuena caca ambegui=20+10.
4	paquegua.	40	tulapocua=20×2.
5	atale.	60	tulapagua=20×3.
6	nercua, or nericua.	80	tulapaquegua=20×4.
7	cublegue.	100	tula atale=20×5.
8	pabaca.	1000	tula guana (guala?) buena.
9	paquebague.		
10	ambegui.		
11	ambegui caca cuenchique=10+1.		

Choco (*Panama*)[4]

1	haba, aba.
2	ome.
3	ompea.
4	kimari, kimane.
5	huasima, juasoma.
6	huasimara-ba, juasoma-aba=5+1.
7	huasimara-nome, juasoma-ome=5+2.
8	huasimara-ompea, juasoma-ompea=5+3.
9	huasimara-kumari, juasoma-kimane=5+4.
10	huasimani manima, ome juasoma=5×2 or 2×5.
11	oma juasoma aba=2×5+1.
15	ompea juasoma=3×5.
20	kimari, or kimane juasoma=4×5.

[1] A. L. Pinart, Coll. Ling. y Etnog. Am. tom. IV, p. 52.
[2] A. L. Pinart, Vocab. Castellano-Dorasque (Chumul, Gualaca, and Changuina dialects).
[3] A. L. Pinart, Vocab. Castellano-Cuna, pp. 6–7.
[4] A. L. Pinart, Vocab. Castellano-Chocoe, pp. 2–3.

Chibcha (near Bogota, Colombia)[1]

1	ata.
2	boza.
3	mica.
4	muyhica.
5	hyzca.
6	ta.
7	cuhupca.
8	suhuza.
9	aca.
10	ubchihica.
11	qhicha ata=10+1.
12	qhicha boza=10+2.
16	qhicha ta=10+6.
20	qhicha (or complete) quihicha ubchihica; also güe and güeta (sig. "foot ten").
21	güetas asaquy ata=20+1.
22	güetas asaquy boza=20+2.
30	güetas asaquy qhicha ata? (güetas asaquy ubchihica=20+10).
40	güetas asaquy qhicha ubchihica? (güe bozas=20×2).
41	güe bozas asaquy ata=20×2+1.
60	güe bozas asaquy qhicha ubchihica? (should be güe micas=20×3).
61	güe micas asaquy ata.
100	güe hizca=20×5.
200	güe ubchihica=20×10.

There is apparently some error in the names for 30, 40, and 60. The term *asaquy* is merely to indicate addition: "*asaquy*, que quiere decir, i mas, con el nombre de las unidades." As *güe bozas asaquy ata* denotes 41, the name for 40 should be *güe bozas*=20×2, as 100 is denoted by *güe hizca*=20×5. The proper term for 30 is probably *güetas asaquy ubchihica* (or *ghicha*)=20+10.

The following is a specimen of the numerals used by the Huave (of Tehuantepec) from Burgoa, Geog. Descrip., tom. II, fol. 396, as quoted by Hubert Bancroft, Native Races.[2]

1	anoeth.	10	agax-poax.
2	izquieo.	11	agax-panoethx?
3	areux.	12	agax-pieuhx.
4	apequiu.	13	agax-par.
5	acoquiau.	14	agax-papeux.
6	anaiu.	15	agax-pacoigx.
7	ayeiu.	20	nicumaio.
8	axpecau.	30	nicumiaomcaxpo.
9	axqueyeu.	100	anoecacoemiau.

Rama (island in Bluefields lagoon)[3]

1	saiming.	4	kunkun-beiso.
2	puk-sak.	5	kwik-astar.
3	pang-sak.		

[1] E. Uricoechea, Gram., Vocab., etc., de la Lengua Chibcha.
[2] Vol. III, p. 758. There are seeming errors in this list.
[3] Brinton, American Race, p. 367.

Bribri (*Talamancan tribe, Costa Rica*)[1]

1	et.	5	skang.
2	but.	6	terl.
3	mnyat.	7	kugu.
4	keng, ka.	8	oschtan, pai, pa.

Brunca (*Talamancan tribe, Costa Rica*)[2]

1	etsik.	5	kchisskan.
2	bug.	6	teschan.
3	mang.	7	kuchk.
4	bachkan.	8	ochtan.

Carrizo (*near Monclova, Coahuila*)[3]

1	pequeten.	4	naiye.
2	acequeten.	5	maguele.
3	guiye.		

DISCUSSION AND COMPARISONS

Before I discuss these lists and attempt to draw conclusions from them, there is one point which deserves notice. It is this: To what extent can these number lists be considered reliable? I do not by this inquiry wish to question the veracity of any author whose works I have quoted or used, but to refer to the method by which the lists were obtained, especially the portions relating to the high numbers. Did the Maya, Aztec, and other tribes make use in actual count or computation of thousands, tens of thousands, hundreds of thousands, and even millions as given in these lists, or have they been filled out, in part, by the authors according to the systems found in vogue? That implicit reliance can be placed on the judgment and accuracy of the more recent authorities who, as is known, derived their information direct from the natives, as Stoll, Gatschet, etc., is conceded, but the lists given by these authors seldom if ever reach beyond the thousand. Most of the lists from the tribes of Mexico and Central America, which run into high numbers, are given by the early authors (chiefly Spanish) or are based on their statements. When the Mexicans spoke of *caxtol-tzontli*=15 *tzontli* (6,000); *cem-poal-xiquipilli*=20 *xiquipilli* (160,000); and *cem-poal-tzon-xiquipilli*=20 times 400 *xiquipilli* (64,000,000—see list), did they have in thought the actual numbers given as equivalents of these terms, or merely measures? When, for example, they said, "15 *tzontli*" (*tzontli* signifying bundle or package) did they intend to signify 15×400, or simply 15 bundles or packages? In other words, did the reference

[1] Adolph Uhle, in Compte Rendu Cong. Americanistes, Berlin, 1888, p. 474.
[2] Ibid., p. 475.
[3] Uhle, Die Länder am untern Rio Bravo del Norte, p. 120, quoted by Brinton, American Race, p. 93.

pass from the number to the measure? To illustrate, if we say 3 barleycorns make 1 inch; 12 inches 1 foot; 3 feet 1 yard; and 1,760 yards 1 mile, do we in speaking of 1 mile have in view the 190,080 barleycorns? When the Mexicans spoke of *xiquipilli* they alluded, according to Clavigero, to sacks or bags. He says, as above quoted, "They counted the cacao by *xiquipilli* (this, as we have before observed, was equal to 8,000), and to save the trouble of counting them when the merchandise was of great value [probably quantity] they reckoned them by sacks, every sack having been reckoned to contain 3 *xiquipilli*, or 24,000 nuts." Now, are we to suppose that in counting the sacks the number of nuts was kept in view? Did the merchant who purchased a *tzontli* of sacks (400) have in mind or purpose buying 9,600,000 nuts? This will suffice to make clear the thought intended to be presented, and will, it seems, justify the question—have the high numbers in these lists been added in accordance with the computation of the recorder, or were they in actual use among the native Mexicans?

As contact with Europeans and their decimal system for nearly four centuries has modified to a greater or less extent the original native method of counting, it is doubtful whether direct reference to the surviving natives of the present day would settle the question. The Maya *pic* has, as we have seen, been changed from 8,000 to 1,000, and the signification of other numeral terms has been changed in similar manner. Our only appeal is therefore to the native records, and here, possibly from our inability to interpret the Mexican symbols, we are limited to the Mayan codices and inscriptions. Here, however, as has been clearly shown in another paper, and as has been proved by Förstemann and Goodman, the evidence is clear that the Maya, or at least the priests or authors of the Dresden codex and the inscriptions, could and actually did carry their computations to the millions, in terms where the number element was necessarily retained, where the primary unit—in these instances the day—had to be kept in view. Of course they made use of the higher units to facilitate counting, as we do at the present day. If the Maya were capable of counting intelligently to this figure, it is not unreasonable to suppose that the more advanced among the surrounding tribes may have made similar, though possibly not so great, progress in their numerical systems. That the Mexicans had symbols for high numbers is asserted by the early historians, and is evident from their remaining codices, but no means of testing these, as the Maya manuscripts and inscriptions have been tested, has yet been found; however, the explanation of symbols carrying the count to the tens of thousands has been given.

Notwithstanding this conclusion, it is apparent that the influence of the European decimal system has been felt in some of the native

counts herein given. This, for example, is probably true of the Huastecan count, where the simple term *xi* is used to denote 1,000, and also in the count from 200 to 900 in this system and in some others.

All the preceding lists showing the count from 10 upward which belong to the Mexican and Mayan groups, except that of the Tarahumari, pertain to the vigesimal system and in method of counting bear a strong general resemblance one to another, yet when they are closely examined minor differences are found which have an important bearing on the question of the origin and relationship of these systems. Of these variations we notice the following:

The Nahuatl count follows strictly the quinary-vigesimal system, as has been already stated, 5 and 15, as well as 20, being basal numbers. The count is always from a lower number, that is to say, the minor numbers are always added to a number passed; thus 41 and 42 are formed by adding 1 and 2 to 40, and not by counting the 1 and 2 on the next or third score, as we have seen was the rule among some of the Mayan tribes, as the Maya proper or Yucatec, the Quiche, Cakchiquel, Pokonchi, Quekchi, Mam, Ixil, and probably most of the southern tribes of the group, but not among the Huasteca, who formed the northern offshoot. The count of the latter, though, like the others of the Mayan group, fundamentally vigesimal to 900, is, like the Nahuatl, by additions of the minor numbers to a number passed—as 20+10 to form 30 and 2×20+10 to form 50. The numeral system of the Mayan tribes generally differed from the Nahuatl, Zapotec, Mazatec, Trike, Mixe, and Zoque systems—all of which are regularly quinary-vigesimal, and generally add the minor numbers to the preceding base—in being more nearly decimal-vigesimal, and in adding the numbers above 40 to the following base, as 1 on the third score, or third 20, to form 41. In the Mayan dialects the count is never based on 5 except, as has heretofore been suggested, from 6 to 8, and in one dialect from 6 to 9. So far, therefore, as these differences are concerned, they tend toward grouping together the systems of the Nahuatlan, Zapotecan, and Zoquean tribes, as contrasted with the Mayan; but the term Nahuatlan is used here as referring only to the stock in its limited sense—the Aztecan branch—as the rule does not hold good throughout, when we pass into the Sonoran branch. However, the grouping on these points is interesting as it is in harmony with other data.

In one peculiarity, however, the Zapotec count differs from the Nahuatl and approaches the Mayan systems. From 55–59, 75–79, and 95–99 the numbers are obtained by subtraction from the next higher base—thus, for 55 they say *ce-caa quiona* or *ce-caayo quiona;* that is, 5 from 60. For 56–59, 76–79, and 95–99 they have two methods of counting—thus for 56 they say *ce-caayo quiona-bi-tobi;* that is, 5 from

60+1, or *ce-tapa quizahachua-cayona*, which is 4 from 60, etc. The Mazateca, Mixe, Zoque, and Trike appear to follow throughout the Nahuatl method of adding the minor numbers to the preceding base.

The Othomian, Tarascan, and Totonacan systems are similar to the Huastecan—that is to say, are decimal-vigesimal—and form the higher numerals by adding the minor numbers to the preceding base.

Extending our inquiry northward to the Sonoran and Shoshonean branches of the Nahuatlan family, we notice the gradual change to the decimal system. For example, in the Cahita count the quinary-vigesimal rule prevails; 6, 7, and 10 are based on 5; 8 on 4; 11 to 19 on 10, or, rather, twice five. From 20 upward the count is vigesimal, 10 when used retaining throughout its form of 2×5. The contact, however, in this region with the decimal system is clearly indicated by the following statement of the author of the Arte Lengua Cahita, given above: "Some nations say *senutacaua* or *seserehere* for 20; others say for 10 *sesarehere* and follow up the count thus: 11, *sesavahere aman senu;* 12, *sesarehere aman uoi*, etc. For 20 they say *uosarehere*, which is two times 10. The Yaqui say for 5 *sesarehere*, and counting from 5 to 5 say *uosarehere*, 10 [=2×5]; *vahivehere*, 15 [=3×5]. These also say for 20 *senu tacaua* [1×20] or *naequivehere* [4×5], and for 25 *sesavehere* (this particular count is of this nation only), and for 100 say *mamnitacaua* [5×20] or *tacauvehere*, which is 20 fives." In the paragraph which follows he states in general terms that some of the tribes count by fives, others by tens, both using the same term, *vehere*, prefixing the "numeral abverbs" *sesa*, "one time," *uosa*, "two times," etc. The "nations" alluded to are probably the Cahita tribes, such as the Tehueco, Zuaque, Mayo, Yaqui, and other related or neighboring tribes.

This change in the application of a given term in closely related dialects is not only interesting, but somewhat remarkable; and added to the fact that the closely related Tarahumari of the same section use the decimal system, indicates that the latter and the vigesimal system here came into contact. Do the data furnish evidence as to which was the spreading or aggressive and which the yielding one? Without entering into a discussion of the question the following facts are presented for the benefit of those desiring to look further into this subject. The similarity of the number names of the Cahita and Tarahumari to those of the Nahuatl is too apparent to pass unobserved even by the mere cursory glance. Include the allied Opata and take for example the numbers 1 to 5 and 10, as follow:

	1	2	3	4	5	10
Opata	se	go-de	vei-de	nago	marizi	makoi
Cahita	se-nu	uoi	vahi, or bei	naequi	mamni	uo-mamni
Tarahumari	bire	oca	bei-ea	naguo	marika	makoe
Nahuatl	ce	ome	yei	naui	macuilli	matlaetli

The resemblance between the names in each column, except *bire*, 1 in Tarahumari (for which Charencey says he finds the alternate *sinepi*, which would be in harmony with the others), and *uomamni* (2×5), 10 in Cahita, is at once apparent. This, however, is merely in accordance with the recognized affinity of the first three idioms with the Nahuatl. It seems, however, that we look in vain to the Nahuatl names for the *vehere* (*vehe-re*) as it can not be derived from *macuilli* (5), *matlactli* (10), or *poalli* (20), nor from the names for 5, 10, or 20 in the Opata, Cahita, or Tarahumari. The name for 20 in Opata is *uri* (*se-uri*), which signifies "man;" in Cahita, *tacaua;* in Tarahumari, *osa-macoi* (2×10). In these languages the only number name which resembles it is that for 3, which is not a divisor.

Turning to the Shoshonean group we notice the following facts. Whether they are sufficient to justify a decision on the point is very doubtful; this, however, is left for the reader to determine. The following list of the names for 2, 5, 10, and 20 is from Gatschet's Forty Vocabularies.[1]

	2	5	10	20
Southern Paiute	vay	manigi	mashu	voyha-mashu
California Paiute	voa-hay	manegi	shuvan	voaha-vanoy
Chemchuevi	vay	manuy	mashu	voyha-mashu
Takhtam	vurm?	ma-hatcham	voa-hamatch	voava-hamatch
Kauvuya	vuy	namu-kuanon	nami-tchumi	vuys-nami-tchumi
Tobikhar	ve-he	mahar	vehes-mahar	hurura-vehe

In these our term appears in exact and (supposed) modified form, but only as the name for 2 even in the composite forms. This is seen in the Tobikhar, as appears from the following list:

Tobikhar

1	pu-gu.	8	vehesh-vatcha=2×4.
2	ve-he.	9	mahar-kabya=5+4.
3	pahi.	10	vehes-mahar=2×5 (2 hands?).
4	va-tcha.	11	puku-hurura=1+10.
5	mahar.	12	vehe-hurura=2+10.
6	pa-vahe=2×3?.	20	hurura-vehe=10×2.
7	vatcha-kabya=4+3?.	30	hurura pahi=10×3.

There is an apparent leaning toward the quinary system in one or two of the dialects, but this has little bearing on the question.

When the count rises above 10 it seems that the term used to designate this number is changed. The same thing is true in regard to numbers in several other idioms of this group. It is possible that we have in this fact an indication of change from an older and more

[1] Wheeler Report, vol. VII.

purely original method of counting to one more recent. It is, in fact, doubtful whether the lists more recently obtained from the natives give throughout the true original method of counting and the ante-Columbian names. There is nothing, however, in the number names of the Shoshonean dialects above 10 to indicate any system other than the decimal.

It appears, therefore, from the data presented, that the vigesimal system prevailed in Mexico and Central America from southern Sonora to the southern boundary of Guatemala, and to some extent as far as the isthmus. There seem to have been but few, if any, tribes in this area as far south as the southern boundary of Guatemala that did not make use of this system; at least the data obtainable bear out this conclusion. North of the northern boundary of this area this system is found, according to Conant,[1] "in the northern regions of North America, in western Canada, and in northwestern United States"; however, the only examples he gives are the systems of the "Alaskan Eskimos," "Tchiglit," "Tlingit," "Nootka," and "Tsimshian." As a general rule the systems of the tribes of the western part of the United States, from the southern boundary to the Columbia river, were decimal or quinary-decimal; however, instances of the vigesimal system appear here and there in this area. As one example we call attention to the numerals of the Hūchnōn dialect of the Yukian family obtained by Mr Stephen Powers at Round Valley reservation, California, given in the preceding chapter.

That a count referring the minor numbers to the next higher base, which is, as we have seen, confined in the southern regions almost exclusively to the dialects of the more southern sections, chiefly to those of the Mayan group, should be found in California is, to say the least, interesting; however, it is not the only example from this section, as will appear. It is somewhat singular that two other idioms of the same family, the vocabularies of which are given by Mr Powers, follow the decimal instead of the vigesimal system. Other examples of this system are found south of the Columbia river, as in the Pomo dialect (Round Valley reservation, California);[2] the Tuolumne dialect (Tuolumne river, California);[3] the Konkau and Nishinam dialects,[4] and the Achomawi dialect.[5] The first, third, and fourth of these appear to refer the count to the following score, while in the last (Achomawi) it is applied to the preceding score. The Tuolumne system is somewhat doubtful, as there are but two numbers (20 and 100) on which to base a decision. According to Major Powell's classification (7th Ann. Rept. Bur. Ethnology), the Pomo are included in the

[1] Number Concept, p. 195.
[2] Powers, Tribes of California, p. 502.
[3] Gibbs, op. cit., p. 548.
[4] Powers, op. cit., p. 596.
[5] Ibid., p. 606.

Kulanapan family; the Achomawi in the Palaihnihan family, and the Konkau and Nishinam in the Pujunan family.

Without referring to other examples it may be stated in general terms that while the vigesimal system has not been found in use east of the Rocky mountains, except in Greenland and among some tribes in the northwestern cis-montane portion of British Columbia, it prevailed to a considerable extent on the Pacific slope from Mexico northward to the Arctic ocean, and it may also be added that it is found among the eastern tribes of Siberia and was the method adopted by the Aino. Conant[1] says that the Tschukschi and Aino systems are "among the best illustrations of counting by twenties that are to be found anywhere in the Old World." These have been given in the preceding chapter for comparison.

The count of the minor numbers in the Aino is based, as will be seen, on the following score, as in the Mayan group. Whether the equivalents added are correctly given is somewhat doubtful, as the proper interpretation of the name for 30 may be 10 on the second score; that for 50, 10 on the third score, etc., as we have indicated in parenthesis. In the Tschukschi the addition is to the preceding score—thus 30 is formed by adding 10 to 20.

These and additional facts of the same character tend to show that in North America the vigesimal system of counting, like some other customs, was confined almost exclusively to that area which I have in a previous work[2] designated the "Pacific section," which includes the Pacific slope north of Mexico and all of Mexico and Central America. This fact and the additional fact that the system prevails in northeastern Asia, while it is rare in other parts of that grand division, except an area in the Caucasus region, and is wanting in the Atlantic slope of North America, are interesting and of considerable importance in the study of the ethnology of our continent.

It would be interesting in this connection to inquire into the range of this numeral system in South America, but we have not the data at hand necessary for this purpose. Conant says in general terms that it prevailed in the northern and western portions of the continent, though it is known that on the Pacific slope it did not extend southward farther than the borders of Peru, where the decimal system prevailed. It appears to have been in use among the Chibchas or Muyscas, a group extending both north and south of the Isthmus. It is or was in use among some of the tribes on the Orinoco, in eastern Brazil, and in Paraguay. However, the range of the system in South America is as yet unascertained.[3]

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[1] Number Concept, p. 191.

[2] Twelfth Ann. Rep. Bur. Ethn., pp. 723-24.

[3] Professor W J McGee suggests that it may possibly hold true in a general sense that the barefoot or sandal-wearing habit accompanied the use of this system of counting.

Before proceeding I wish to quote some remarks by Conant in regard to the origin and spread of the vigesimal system, which I will then refer to.[1]

In its ordinary development the quinary system is almost sure to merge into either the decimal or the vigesimal system, and to form, with one or the other or both of these, a mixed system of counting. In Africa, Oceanica, and parts of North America, the union is almost always with the decimal scale; while in other parts of the world the quinary and the vigesimal systems have shown a decided affinity for each other. It is not to be understood that any geographical law of distribution has ever been observed which governs this, but merely that certain families of races have shown a preference for the one or the other method of counting. These families, disseminating their characteristics through their various branches, have produced certain groups of races which exhibit a well-marked tendency, here toward the decimal and there toward the vigesimal form of numeration. As far as can be ascertained, the choice of the one or the other scale is determined by no external circumstances, but depends solely on the mental characteristics of the tribes themselves. Environment does not exert any appreciable influence either. Both decimal and vigesimal numeration are found indifferently in warm and in cold countries; in fruitful and in barren lands; in maritime and in inland regions; and among highly civilized or deeply degraded peoples.

Whether or not the principal number base of any tribe is to be 20 seems to depend entirely upon a single consideration; are the fingers alone used as an aid to counting, or are both fingers and toes used? If only the fingers are employed, the resulting scale must become decimal if sufficiently extended. If use is made of the toes in addition to the fingers, the outcome must inevitably be a vigesimal system. Subordinate to either one of these the quinary may and often does appear. It is never the principal base in any extended system.

To the statement just made respecting the origin of vigesimal counting, exception may, of course, be taken. In the case of numeral scales like the Welsh, the Nahuatl, and many others where the exact meanings of the numerals can not be ascertained, no proof exists that the ancestors of these peoples ever used either finger or toe counting; and the sweeping statement that any vigesimal scale is the outgrowth of the use of these natural counters is not susceptible of proof. But so many examples are met with in which the origin is clearly of this nature that no hesitation is felt in putting the above forward as a general explanation for the existence of this kind of counting. Any other origin is difficult to reconcile with observed facts, and still more difficult to reconcile with any rational theory of number system development.

I note some facts, taken in part from the work quoted, in order that the reader may see the bearing they have on the opinions expressed in this quotation. According to the data furnished by this writer it seems that this system occurred in Europe only along the western seacoast and that almost exclusively among the Celts, the only group of the Aryan stock which seems to have used it. In Asia it has been found to any extent only in the Caucasic group and in the northeastern part of of the continent, that is, in what Brinton terms the "Arctic Group" of his Siberic branch. Not a single example is noted from the Sinitic group or from the Semitic branch. In Africa none have been reported from the Hamitic group, and but few from the negro dialects, but the latter field has been only superficially examined in this respect. Not a single

[1] Number Concept, p. 176–8.

example is noted from Polynesia or from any of the Malayan dialects. So far the data seem to agree with Conant's conclusion, but more detailed examination presents at least some exceptions.

We see the Nahuatlan family divided into two groups in this respect, the Aztecan and part of the Sonoran branches using the vigesimal system, while the Shoshonean and other divisions of the Sonoran branch follow the decimal method. Among the multiplicity of small linguistic families in California and Oregon examples of the vigesimal system occur sporadically, so far as is indicated by the still incomplete data, even occurring in one or two small tribes of a family while other tribes of the same family use the decimal system. But it is necessary to bear in mind that here, as in the Shoshonean group, the lists have been obtained after there has been long intercourse with the whites, which may have materially modified original systems. These facts are sufficient to show that ethnic lines do not always govern the range of the system.

That there is a very general agreement among students in the opinion that as a general rule the adoption of the vigesimal system results from bringing the toes as well as the fingers into the count is admitted, yet it is possible that there are more exceptions to the rule than is supposed. That every vigesimal as well as decimal system has 5 at the base, or in other words, started with the hand, may be safely assumed, and that whenever 20 is expressly or impliedly understood as the equivalent of "one man" the toes are *considered* in the count may, perhaps, also be assumed. However, there are reasons for believing that in some instances the hands alone were used in actual count, being doubled to make the whole man; yet in such cases the toes were probably originally used.

It is possible and even probable that in some cases where the numeral terms have no reference to the toes or man a change from the original name has taken place. Such a change seems to be shown in the name for 20 in the Mayan dialects. In the Huasteca, Pokonchi, Pokomam, Cakchiquel, Quiche, Uspanteca, Ixil, Aguacateca, and Mam the name for 20 is "man," while in the Maya, Tzotzil, Chañabal, Chol, and Kekchi other terms are used, but even in these (except the Maya and Chol) *vinik*, or "man," is introduced into the terms for the multiples of 20. Even in the Mexican (Aztec), which Conant looks upon as an exception, *cempoalli* (=one 20), which signifies "1 counting," evidently refers to something so well known and so generally understood as to require no explanatory term. What else could this, the thing counted, have been than one man—the fingers and toes? Although it must be admitted that there are some systems which can not be explained in this way, yet the explanation may be accepted as generally, in fact, almost universally, applicable. Even among the Greenland Eskimo, where we would suppose Professor McGee's sug-

gestion, given in a note above, would fail, the toes were brought into the count, as shown by the following terms:

11 achqaneq-atauseq—first foot 1.
16 achfechsaneq-atauseq—other foot 1.
20 inuk navdlucho—a man ended.

Why tribes belonging to the same well-defined, limited linguistic group and living geographically in close relation—as, for example, in the Cahita group of northwestern Mexico and one or two of the California groups—should adopt different systems, some the vigesimal and others the decimal, we are unable to answer with our present information. Before answer can be made it will be necessary to eliminate what has been derived from contact with the whites.

In concluding this topic it may be added that Conant appears to be fully justified by the data in infering that environment exerts no appreciable influence in determining the system. In the regions occupied by the Semitic, Hamitic, and Polynesian races, where we should most expect to find the vigesimal system, it is entirely unknown, while, on the contrary, it is found in the frozen regions of the north, where it would be least of all expected. As yet we are unable to assign any general influencing cause for its development.

While the chief object of this paper is an examination and discussion of the numeral systems of the Mexican and Central American tribes with special reference to their relation to the Nahuatlan and Mayan systems, another object is to bring together the data which seem to have a bearing on the questions of the origin, development, and relations of these systems. In accordance, therefore, with this object, a comparison of the names used in counting (1 to 5, 10, and 20) in a number of dialects is herewith presented. It is true that nearly all of these can be found in the preceding lists. The object of reintroducing them here is to bring the corresponding names into close contrast for convenience in comparison. They are brought together in the order of the groups, the Nahuatlan, which is the most extensive, coming first. The names in the Mayan series are so uniform that it is unnecessary to reintroduce them here.

	1. Nahuatl	2. Pipil	3. Alaguilac	4. Cahita
1	ce	ce	se	senu
2	ome	ume	umi	uoi
3	yei	yei	hei	vahi, or bei'bey
4	naui	navui	nagui	naequi
5	macuilli	macuil	makuil	mamni
10	matlactli	mahtlati	matakti	uo-mamni
20	cem-poalli	cempual	sempual	tacahua

	5. Opata	6. Tarahumari	7. Tepehuan	8. Kern River
1	se, or seni	bire, or sinepi	uma	chich
2	gode	oca, or guoca	gokado, or gaok	wah
3	veide	beica	veicado	pai
4	nago	naguo	maukao	na-nau
5	marizi	mariki	chetam	mahaichinga
10	makoi	makoe	———	umhaichinga
20	seuri	bosamacoi	———	———

	9. Pima		10. Gaitchaim		11. Shoshone (number 6)	12. Southern Pai-ute
1	humak	1	so-pul	1	shoui	shui
2	houak	2	vue	2	waii	vay
3	vaik	3	pahe	3	pahi	pay
4	kiik	4	vosa	4	wachoui	vatchue
5	huitas	5	mahaar	5	manek	manigi
10	wistima	7	se-ula	10	matshoui	mashu
20	ku'ko-wisti-ma			20	wai-matsho-ui	voyha-mashu

	13. Chemehuevi	14. Capote Uta	15. Shoshone (number 5)	16. Comanche
1	shooy	soois	simitich	semmus
2	vay	wy-une	hwat, or wat	waha
3	pay	pi-une	pite	pahu
4	vatchue	watssu-une	watsuet	hagar-sowa?
5	manuy	manegin	managet	mawaka
10	mashu	towumsu-une	shimmer	shurmun
20	voyha-mushu	wah-massee	wam-i-no	———
				8 nahua-wachota =4×2

	17. California Pai-ute	18. Kauvuya	19. Kechi (San Luis)	20. Cahuillo
1	shumuue	sople	suplöh	supli
2	voahay	vuy	whii	me-wi
3	pahi	pa	paa	me-pai
4	voatsagve	vuitchiu	witcho	me-wittsu
5	manegi	namu-kuanon	nunmu-quano	nome-kadnun
10	shuvan	nami-tchumi	———	nomat-sumi
20	voaha-vanoy	vuys-namitchumi	———	———

	21. Takhtam	22. Tobikhar	23. Kij	24. Kechi (S. Diego)
1	aukpeya	pugu	puku	tchoumou
2	vurm?	vehe	wehe	echyou
3	pahe	pahi	pahe	micha
4	voatcham	vatcha	watsa	paski
5	ma-hatcham	mahar	maharr	tiyerva
10	voa-hamatch	vehes-mahar	———	touymili
20	voa-va-hamatch	hurura-vehe	———	———

	25. Hopi[1]	26. Millerton	27. Tejon Pass	28. Cora
1	sukia	si-muh	pau-kup	ceaut
2	luen	wohattuh	wah	huapoa
3	payam	pait	pahai	huaeica
4	naleem	watsukit	watsa	moacoa
5	tcivo	malokit	mahats	amauri
10	pakte	se-wanu	we-mahat	tamoamata
20	shuna-tu	———	———	———

	29. Zapotec	30. Mixtec	31. Chuchon	31. Popoloca
1	tobi, or chaga	ee (ce?)	ngu	gou
2	topa, or cato	wui	yuu	yuu
3	chona, or cayo	uni	ni, or nyi	nii
4	tapa, or taa	gmi, or kmi	ñuu	noo
5	caayo, or gayo	hoho	nau	nag-hou
10	chii	usi	te′	tie
20	cal le	———	———	kaa
		11 usi-ce		

	32. Trike	33. Mazateca	34. Zoque	35. Mixe
1	ngo	gu	tuma	tuuc
2	nghui	ho	metza	metsk
3	guañânha	ha	tucay	tukok
4	kaha	ni-ku	macscuy	maktash
5	huhûha	û	masay, or mosay	mo′koshk
10	chia	te	macay	makh, or mahc
20	hikoo, or kooha	kâ	yps, or ips	ypx

[1] Furnished by Dr J. W. Fewkes.

	36. Pupuluca (Tepeaca)	37. Othomi	38. Pirinda	39. Tarasco
1	tuub	n'nra, or ra	yndahhuy	ma
2	mesko	yoho	ynahuy	tziman
3	tuo	hiu	ynyuhu	tanimu
4	maktaxko	gooho	yncunohuy	tamu
5	mokoxko	kuta, or qyta.	yncuthaa	yumu
10	mako	reta	yndahatta	temben
20	ipxe	n-rahte	yndohonta	macquatze

	40. Totonaca	41. Sinacanta	42. Jutiapa	43. Cabecar
1	tum	ica	ical	estaba
2	tuyun	ti	piar	bocteba
3	tutu	uala	guarar	mañalegui
4	tati	hiria	iriar	quetovo
5	kitsiz	puh	puhar	exquetegu
10	kau, or cauh	pakil	paquilar	dope
20	———	———	———	ynste

	44. Viceyta	45. Lean y mulia	46. Terrava	47. Mosquito
1	etabageme	pani	krara	kumi
2	butteba	matiaa	krowü	wal
3	mañac	contias	krommia	niupa
4	quiet	chiquitia	krobking	walwal
5	exquetegu	cumasopni	kraschkingde	matasip
10	dop	comassopnas	dwowdeh	matawalsip
20	ynste	comascoapssub	zac-vbu	———

Although the first twenty-eight lists in this series, which are from idioms of the Nahuatlan stock, might possibly be arranged in a more systematic order as to terms, yet a careful study will suffice to detect the links by which they appear to be connected, thus agreeing with the conclusion of the linguists in regard to the relationship of the different groups of this great family. The terms for 2 and 3 appear to be the most persistent, especially the latter term, which shows but slight variation, except in the Kechi (San Diego) and Cora dialects. While the differences between the names in this family and the others represented in the series is too clearly marked to be overlooked, corresponding in this respect with the decision of the linguists in regard to

the family distinctions, we notice here and there slight indications of the influence of intercourse.

Numbers 44 to 48, which pertain to the extreme southern dialects, are added merely for the purpose of comparison. The first four (44 to 47), are classed with the Chibcha stock, among which the vigesimal system prevailed.

In the tribes from the Mexican boundary northward, with the exception of those pertaining to the Nahuatlan group, most of which have been noticed, we find nothing in the numerals, so far as the data at hand show, to indicate any relationship other than that in accordance with the linguistic classification proposed by Major J. W. Powell. An apparent approach to the names in some of the Shoshonean dialects can be noticed in the Konkau, Nishinam, and Nakum dialects heretofore given.

The count in two of these idioms is, as has been already mentioned, in part, at least, vigesimal. Compare the Nakum list with that of Shoshone (number 5). These tribes are included in Major Powell's classification in his Pujunan family. The determination whether such resemblances are real or only apparent must be left to the linguists; I have included them merely as material for comparison.

Before closing this chapter attention is called to one point which, so far as I am aware, has not been discussed, but in regard to which I must acknowledge inability to offer an entirely satisfactory explanation.

As has been shown in my paper on the calendar systems, and by the evidence presented by Dr Förstemann and Mr Goodman, the Mayan priests, or at least the authors of the Dresden codex and the Mayan inscriptions, did actually perform computations reaching into the millions, where the primary unit had necessarily to be retained, that is, could not be lost in higher units considered as measures. To illustrate: Take the following time count actually found in one of the Central American inscriptions: 8 cycles+14 katuns+3 ahaus+1 month+12 days, to the day 1 Eb, the 5th day of the month Zac. As 1 cycle equals 20 katuns, 1 katun equals 20 ahaus, 1 ahau equals 18 months, and 1 month equals 20 days, we can find by calculation that 1 cycle=144,000 days, 1 katun=7,200 days, and 1 ahau=360 days, and that the 8 cycles, 14 katuns, 3 ahaus, 1 month, and 12 days added together equal 1,253,912 days. The reader is familiar with the methods necessary to make this and all such computations. How did the Maya scribe or priest accomplish it? As a particular day was to be reached and there were numbers in each order of units, and the total had to be transferred into years of 365 days each, and the surplus months and days ascertained, it is apparent that it was necessary to reduce the whole to primary units—that is, to days—and then ascertain by division or in some other way, how many even years were contained therein, and how many months and days would be contained in the overplus.

That they had time tables by which they could compute intervals of moderate length, as the day series in the Codex Cortesianus, which could be used as the Mexican Tonalamatl, is well known; we can use them to-day for that purpose. It would seem also from the four plates in the Dresden codex, and four in the Troano codex, showing the four year series, that they also had tables by which to count year intervals, but there are no indications of tables to aid in the reduction of the higher orders of units—cycles, katuns, etc. In the Mexican manuscripts, as will be seen in the following chapter, the number of *tzontli* (400 each) and *xiquipilli* (8,000 each)—the highest counts discovered therein—were indicated simply by repeating the symbols, but the Maya had reached the art of numbering their symbols. Now, it is apparent that the latter must have had some method of computation where such high numbers as those indicated were involved. This was necessary even to ascertain the number of days in a cycle or katur, and when several of these and of each of the lower units were to be reduced to primary units, or days, and these to be changed into years, months, and days, and the commencing and ending dates determined, the count would seem to transcend the power of simple mental computation. How then was this accomplished? It would seem, therefore, that they must have had some way of making these lengthy calculations other than counting "in the head;" but what it was we have no means of determining.

There would seem to be no doubt that they had a way of "ciphering"—to use a schoolboy term—and this appears to be confirmed by Landa, who, speaking of their method of counting, says:

> Que su cuenta es de v en v, hasta xx, y de xx en xx, hasta c, y de c en c hasta 400, y de cccc en cccc hasta VIII mil. Y desta cuenta se servian mucho para la contratacion de cacao. Tienen otras cuentas muy largas, y que las protienden *in infinitum*, contandolas VIII mil XX vezes que son C y LX mil, y tornando a XX duplican estas ciento y LX mil, y despues yrlo assi XX duplicando hasta que hazen un incontable numero: cuentan en el suelo o cosa llana.

The last phrase, "cuentan en el suelo o cosa llana," indicates the manner in which they made their calculations, to wit, on the ground or on some flat or smooth thing. Brassuer translates the sentence thus: "Leurs comptes se font sur le sol, ou une chose plane." This certainly indicates "figuring" or performing calculations by marking on a smooth surface. Although multiplication and division seem impossible with their symbols, it is possible, as Professor McGee suggests to me, that they reached the desired result by repeated additions and subtractions. These operations may be readily performed with the ordinary number symbols (dots and short lines), the orders of units being indicated by position, as in the Dresden codex. The chief difficulty would be to change the sum of units into years. This, when the number was large, must have been accomplished by means of what Goodman calls the "calendar round" or 52-year period, for which

they had a specific symbol, though not of the ordinary form. The sum (18,980) could be expressed thus:

$$
\begin{array}{rr}
\cdot\ \cdot & = 14,400 \\
\overset{\cdot\ \cdot}{=} & = 4,320 \\
\overset{\cdot\ \cdot\ \cdot}{=} & = 260 \\
 & = 0 \\
\hline
 & 18,980
\end{array}
$$

By using this form and subtracting until the given sum should be reduced below 18,980 the number of subtractions would indicate the number of 52-year periods. The years could be obtained in the same way by repeated subtractions from the overplus with the ordinary symbols, thus:

$$
\begin{array}{rr}
\cdot & = 360 \\
 & = 0 \\
\text{——} & = 5 \\
\hline
 & 365
\end{array}
$$

Whether this was the method followed I can not say, but it is certain that the desired result could be obtained in this way. Nevertheless, this method of changing high series, reaching into millions of years, must have been very tedious, unless there was some way of shortening the process. I may, however, have more to say on this subject in a subsequent paper, in which I propose to discuss the Quirigua inscriptions.

NUMBERS IN THE MEXICAN CODICES

The data relating to the use of numbers in the Mexican codices, so far as we are as yet able to interpret the symbols, are meager compared with those relating to numbers in the Mayan codices and inscriptions. We lack also in this investigation the means of demonstration in regard to the higher numbers, being limited in this respect to the statements of historians and the interpreters of the Mendoza and Vatican codices. However before proceeding with the examination of the codices, it is necessary to refer briefly to certain facts in regard to the Mexican time system.

This system is, as is well known and as I have shown in a previous paper,[1] like that of the Maya, except in the names of the days and months and in the symbols used to represent them. As there will be occasion to refer to these in discussing the numbers in the Mexican codices they are for the convenience of the reader given here. A condensed calendar like that used in discussing Mayan dates in our previous paper is also given.

[1] Notes on certain Mayan and Mexican Manuscripts, in Third Ann. Rep. Bur. Eth.

The days as represented in the codices when placed in regular succession are as shown in table 1.

TABLE 1

1	Cipactli.	11	Ozomatli.
2	Ehecatl.	12	Malinalli.
3	*Calli.*	13	*Acatl.*
4	Cuetzpallin.	14	Ocelotl.
5	Coatl.	15	Quauhtli.
6	Miquiztli.	16	Cozcaquauhtli.
7	Mazatl.	17	Ollin.
8	*Tochtli.*	18	*Tecpatl.*
9	Atl.	19	Quiahiutl.
10	Itzcuintli.	20	Xochitl.

In attempting to form a condensed calendar for the Mexican system difficulties are met with which do not arise in forming one for the Mayan system. There can be no question that the year-bearers or dominical days were Tochtli, the rabbit; Acatl, the reed; Tecpatl, the flint or flint knife, and Calli, the house; but were these the first days of the years? Gemelli Carreri[1] says that the year Tochtli began with the day Cipactli, Acatl with Miquiztli, Tecpatl with Ozomatli, and Calli with Cozcaquauhtli, in which he is supported by Clavigero,[2] while Boturini and Veytia declare that they began with the dominical days. As the latter method appears to be the natural one, and is that adopted by Miss Nuttall[3] after a somewhat careful examination of the subject, I shall follow it. My condensed calendar will therefore be as shown in table 2.

---

[1] Churchill's Voyages, vol. IV, p. 492.
[2] Hist. Mexico, Cullen's Transl., vol. I, p. 292.
[3] Notes on the Ancient Mexican Calendar System, p. 5.

Table 2

Tochtli years	Acatl years	Tecpatl years	Calli years													
Tochtli	Acatl	Tecpatl	Calli	1	8	2	9	3	10	4	11	5	12	6	13	7
Atl	Ocelotl	Quiahuitl	Cuetzpallin	2	9	3	10	4	11	5	12	6	13	7	1	8
Itzcuintli	Quauhtli	Xochitl	Coatl	3	10	4	11	5	12	6	13	7	1	8	2	9
Ozomatli	Cozcaquauhtli	Cipactli	Miquiztli	4	11	5	12	6	13	7	1	8	2	9	3	10
Malinalli	Ollin	Ehecatl	Mazatl	5	12	6	13	7	1	8	2	9	3	10	4	11
Acatl	Tecpatl	Calli	Tochtli	6	13	7	1	8	2	9	3	10	4	11	5	12
Ocelotl	Quiahuitl	Cuetzpallin	Atl	7	1	8	2	9	3	10	4	11	5	12	6	13
Quauhtli	Xochitl	Coatl	Itzcuintli	8	2	9	3	10	4	11	5	12	6	13	7	1
Cozcaquauhtli	Cipactli	Miquiztli	Ozomatli	9	3	10	4	11	5	12	6	13	7	1	8	2
Ollin	Ehecatl	Mazatl	Malinalli	10	4	11	5	12	6	13	7	1	8	2	9	3
Tecpatl	Calli	Tochtli	Acatl	11	5	12	6	13	7	1	8	2	9	3	10	4
Quiahuitl	Cuetzpallin	Atl	Ocelotl	12	6	13	7	1	8	2	9	3	10	4	11	5
Xochitl	Coatl	Itzcuintli	Quauhtli	13	7	1	8	2	9	3	10	4	11	5	12	6
Cipactli	Miquiztli	Ozomatli	Cozcaquauhtli	1	8	2	9	3	10	4	11	5	12	6	13	7
Ehecatl	Mazatl	Malinalli	Ollin	2	9	3	10	4	11	5	12	6	13	7	1	8
Calli	Tochtli	Acatl	Tecpatl	3	10	4	11	5	12	6	13	7	1	8	2	9
Cuetzpallin	Atl	Ocelotl	Quiahuitl	4	11	5	12	6	13	7	1	8	2	9	3	10
Coatl	Itzcuintli	Quauhtli	Xochitl	5	12	6	13	7	1	8	2	9	3	10	4	11
Miquiztli	Ozomatli	Cozcaquauhtli	Cipactli	6	13	7	1	8	2	9	3	10	4	11	5	12
Mazatl	Malinalli	Ollin	Ehecatl	7	1	8	2	9	3	10	4	11	5	12	6	13

The symbols of the days are shown in figure 23, which is a photo-engraved copy from plates 51–52 of the Vatican codex B. The names in English of those in the four columns 8–11 as they stand in the figure are as follow:

Column 8	Column 9	Column 10	Column 11
Water	Dog	Monkey	Grass
Movement	Flint	Rain	Flower
Snake	Death	Deer	Rabbit
Cane	Tiger	Eagle	Vulture
Dragon	Wind	House	Lizard

The symbol for water is oftener in the form shown in figure 24, and that for house in the form shown in figure 25. As the numerous plates of the codices to which reference will be made can not be copied here, these will enable the reader who is not already familiar with the subject, but who has the codices (at least as given in Kingsborough) before him, to follow my references. As the names of the Mexican months will not be used in this paper, it is not necessary to give them here. We shall have occasion to note particularly the direction in which the plates of the codices referred to are to be read, as the determination of this is the most important result obtained by an examination of the numerals, especially in cases where the order of the days fails us in this respect.

As a rule which has few if any exceptions, numbers which refer to time counts in the Mexican codices are expressed by dots, or sometimes small circles, usually colored, and

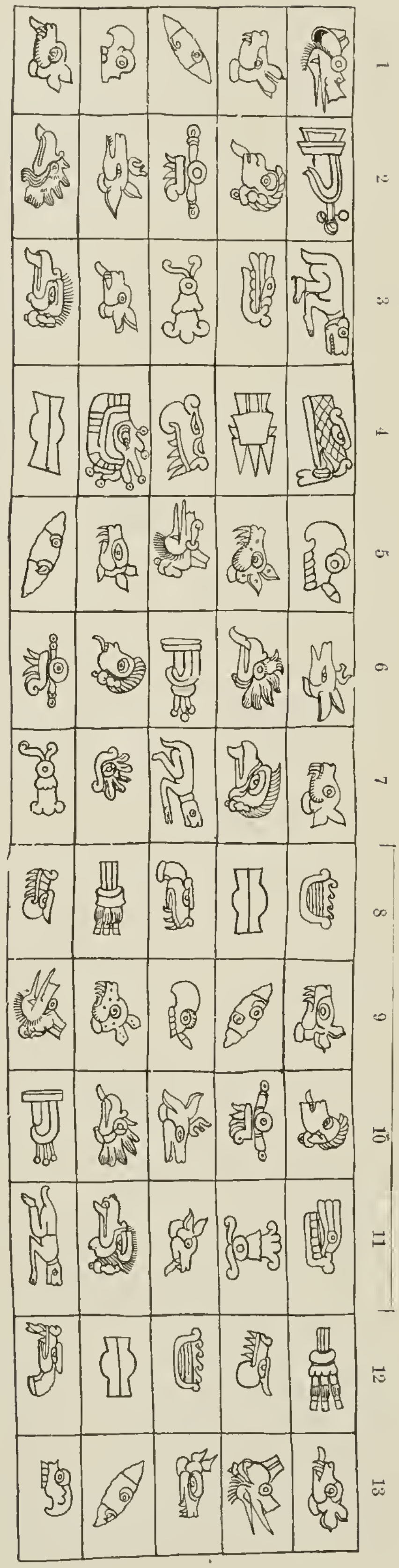
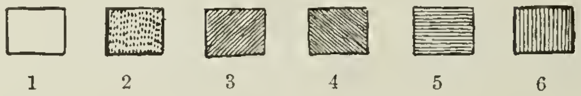


Fig. 23—Symbols of the Mexican days.

never running higher, so far as has yet been determined, than 26. Their use is seen on plates 17–56 of the Vatican Códex number 3738



Color scheme used in figures 24–40.
1, yellow and white; 2, brown; 3, drab; 4, green; 5, blue; 6, red.

and in other similar counts. Here they are used to number the days in regular succession, beginning with 1 Cipactli, 2 Ehecatl, 3 Calli, etc., counting to 13, and then commencing again with 1, etc., as was the rule in the Mayan day-count. As the series on the pages referred to (the order being from left to right) runs through two hundred and sixty days, or twenty thirteens, the Mexican method of numbering days is clearly and distinctly shown. In this series two plates are allowed to each thirteen days, five days on the first (plate 17) and eight on the second (plate 18), five on the third, eight on the fourth, etc. Why this division into 5 and 8, when 6 and 7 is the usual method, is not apparent unless it was best adapted to the size of the original page, or was to introduce the 5. It is possible the latter explanation is the correct one, as the eight days are arranged in a line of 5 and column of 3, and the numerals above 5 are, with but two or three apparently accidental exceptions, arranged with reference to 5, thus:

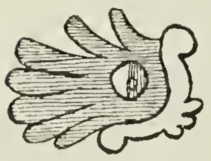


Fig. 24—Symbol for Atl (water).

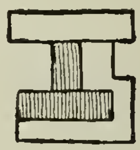


Fig. 25—Symbol for Calli (house).

6	10 . . . .
7	11 . . . .
8	12 . . . .
9	13 . . . .

This arrangement, which would seem to be merely for convenience in counting rather than for any mystic purpose, is not found in the Borgian or Bodleian codices, which are undoubtedly pre-Columbian, while the Vatican (3738) is, in part at least, post-Columbian. The numerals are, as is general in the codices, of different colors; for example, 1, the first of the series referred to, is green, the next (2) is yellow, the next (3) blue, the next (4) red, the fifth green, the sixth, seventh, and eighth red, the ninth yellow, the tenth red, the eleventh blue, the twelfth red, the thirteenth green, etc. The color no doubt had a signification understood at least by the priests, but which there is, so far as is known, no way of determining at this day.

Fig. 26—Symbol for Itzquintli (dog).

Fig. 27—Symbol for Ocelotl (tiger).

In the same codex, on plates 91, 92, and 93 and those which follow,

we see the years indicated by the symbols for Tochtli, Acatl, Tecpatl, and Calli, and numbered in regular succession. Here, as in case of the days, the numbering is from 1 to 13, this order being repeated throughout. There is in this series one continuous stretch of 208 ($=4\times52$) years without a single break in the order of the years or of the numbers. We have in this fact proof not only that the years were numbered as in the Mayan calendar, and were of the same length, the 365 being completed by the addition of five days at the end, as was stated by the early writers (for only in this way can this succession be accounted for), but also presumptive evidence, although not positive proof, that there was no provision for bissextile years, unless it was made by counting unnumbered and unnamed days. As the years are numbered from the day numbers as they come in regular succession, there could be no additional numbered and named days without making a jog in the numbering of the years. The assumption that there were added days which were neither named nor numbered is a mere supposition based on the seeming need of them; there appears to be no proof of it in the codices.

On plates 59–62 of the Mendoza codex we find numerals used to state the different ages of youth from 3 to 15. These are given by the little circles already described, all of them in this instance being blue. From 3 to 6 they are placed in single straight lines. The other numbers are given thus:

```
            .                       . .
 7  . . . . . .                 . . . . .
                           12   . . . . .

    . . . .                         . . .
 8  . . . .                     . . . . .
                           13   . . . . .
    . . . .
 9  . . . . .                     . . . .
                                . . . . .
    . . . . .              14   . . . . .
10  . . . . .

            .                   . . . . .
    . . . . .                   . . . . .
11  . . . . .              15   . . . . .
```

While there are indications of the tendency to count by fives, it seems a little strange that the arrangement of the dots in 7 and 8 should have varied from this rule. Attention is called to these seemingly unimportant points in view of what has been said in the preceding part of this paper in reference to the Mexican method of counting as indicated by the names of their numerals. In the lists of years on the first seven plates of this codex the numbers above 5 are arranged in almost every instance by fives or with regard to 5. However, it is necessary to bear in mind that most, if not all, of this codex is

post-Columbian, an explanation of it having been made by native priests and turned into Spanish for the use of the Emperor Charles V. It must be admitted, however, that very slight, if any, indications of European contact are to be found in it.

Turning now to the Fejervary codex, to plates 22, 21, 20, etc., to 13 (taking them backward as paged), we find the method of counting from day to day, and thereby the order in which the days are to be taken. As the colored figures can not be introduced here, Arabic numbers are substituted for the dots or little circles, and the day names, for the symbols. The relation one to another in which they stand on the plates is maintained. The pages are given in the order of the numbering, but are to be read in the opposite direction, beginning with 22.

PLATE 13

Upper line: Xochitl, Quiahuitl, Tecpatl. 3 Ocelotl.
Lower line: 23 Tochtli. 13 Ocelotl.

PLATE 14

Upper line: 3 Itzquintli. 3 Miquiztli.
Lower line: 12 Cipactli. 9 Ozomatli.

PLATE 15

Upper line: 2 Calli. 1 Cipactli.
Lower line: 10 Xochitl. 7 Malinalli.

PLATE 16

Upper line: 3 Ollin. 3 Acatl.
Lower line: 7 (?) 10 (?)

PLATE 17

Upper line: 3 Atl. 3 Coatl. 3 Cipactli.
Lower line: 8 (?) 9 (?)

PLATE 18

Upper line: 3 Ollin. 3 Acatl. 3 Atl.
Lower line: 6 (?) 5 (?)

PLATE 19

Upper line: 3 Coatl. 3 Cipactli. 3 Ollin.
Lower line: 6 Atl, Coatl, Ollin, Acatl, Cipactli.

PLATE 20

Upper line: 3 Acatl. 3 Atl. 3 Coatl.
Lower line: (?) 7 Acatl.

PLATE 21

Upper line: 3 Cipactli. 3 Ollin. 3 Acatl.
Lower line: 4 Tochtli. 2 Coatl. 4 Xochitl. 2 Ollin.

Plate 22

Upper line:	3 Atl.	3 Coatl.	3 Cipactli.
Lower line:	4 Malinalli. 2 Atl.	4 Cuetzpallin.	2 Cipactli.

In counting in this case the numbers are to be understood as indicating the intervening days, and do not include either the day counted from or the day reached. The "lower lines" are throughout independent and not connected with the "upper lines." Commencing with Cipactli at the right of the lower line of plate 22, and referring to table 1 for the list of the days, we see that counting forward—that is, passing over—two days we reach Cuetzpallin; passing over four more we come to Atl; passing over two more brings us to Malinalli, and four more to Ollin, which is found at the right of the lower line of plate 21; and so we reach Acatl, the right of the lower line of plate 20. Counting 7 from the last brings us to Cipactli. As the count here ends with Xochitl, the last of the twenty days, this series may end here, or may pass to Cipactli. However, as there are no day symbols to guide us until we get back to plate 15, where we find 7 Malinalli at the right, we begin again with this day.

Passing over seven days from Malinalli we reach Xochitl; passing over ten more we reach Ozomatli, at the right of the lower line of plate 14. Passing over nine more we come to Cipactli; twelve more bring us to Ocelotl, at the right of the lower line of plate 13; thirteen more to Tochtli; twenty-three more would bring us to Malinalli, but the day is not found, as the series appears to end here. Possibly we go back, as is a common rule in the Troano codex, to the first date; if so, Malinalli, on plate 15, begins a second series. This is probably the true method, as adding together the counters and the days represented by symbols gives eighty, just four twenties. It is probable that the same rule applies to the first series, beginning with Cipactli (plate 22) and ending with 7 Acatl (plate 20), as the counters and days added together make forty, or two twenties.

Taking now the upper line, beginning with 3 Cipactli at the right (plate 22), we pass over three days, which brings us to Coatl, three more to Atl, and so on by threes to Ollin at the left of plate 16; three days more bring us to Cipactli, but whether to the beginning or to 1 Cipactli at the right of the upper line of plate 15 is a question. However, as the number of days counted up to this point is 80, or four twenties, and a new series begins in the lower line with Malinalli at the right of plate 15, it is most likely a new series begins here with Cipactli in the upper line. This supposition appears to be confirmed by the fact that to Xochitl at the left of the upper line of plate 13 is just twenty days.

No attempt will be made at this point to explain the figures connected with these day and numeral series, the only object in view at present being to illustrate the use of the numerals and thereby to show

the direction in which the plates are to be read. It is clear that in this case they are to be read from right to left; that is, in a reverse order to the paging.

We turn next to plates 11 and 12 of the same codex. Here, as in the preceding illustrations, the series of counters and days are placed in two lines, an upper and a lower; however, the numbers in the lower, apparently because of the want of space, are not placed in connection with the day symbols, but by the side of the larger figures. In each section of the lower line are five day symbols; for convenience I have placed the names in columns, the top one corresponding with the symbol at the left in the plate.

PLATE 11

Upper line:	4	Malinalli.	4	Mazatl.
		Tochtli.		Quauhtli.
		Cozcaquauhtli.		Calli.
Lower line:	12	Cuetzpallin.	12	Ozomatli.
		Malinalli.		Quiahiutl.
		Xochitl.		Mazatl.

PLATE 12

Upper line:	4	Ehecatl.	4	Ollin.
		Ehecatl.		Atl.
		Itzcuintli.		Ollin.
Lower line:	12	Tecpatl.	12	Coatl.
		Miquiztli.		Acatl.
		Ocelotl.		Cipactli.

Commencing with Cipactli at the right of the lower line of plate 12, we go backward (upward as given in the list above) to Atl, then to Ocelotl and back (up) to Ehecatl, thence to Mazatl, right of lower line, plate 11, and so on to Tochtli. We begin the upper line with 4 Ollin, at the right of plate 12. Passing over four days we reach Ehecatl; four days more bring us to Mazatl, upper line, plate 11; four more to Malinalli, and four more back to Ollin, thus covering twenty days. The Ollin symbol of this series (plate 12) is immediately under the blue sitting figure; Mazatl, or Deer (plate 9, upper line) is represented by the foot or lower portion of the leg of a deer. This proves that the reading is from right to left and from the bottom upward as in the preceding plates. It also enables us to determine positively the unusual Mazatl symbol.

The days in the lower line are arranged five to a section, after the manner explained in a previous paper.[1] Commencing with Cipactli, at the right (bottom in our list) of plate 12, we count or pass over twelve days and reach Ocelotl, the day at the right (bottom) of the left series of the same plate; twelve more bring us to Mazatl, right

[1] Notes on Certain Maya and Mexican Manuscripts, in the Third Annual Report of the Bureau of Ethnology.

of plate 11; and twelve more to Xochitl, right of the left series, same plate; counting twelve more brings us to Acatl. As this makes no connection, let us try another method: Counting from Atl, the left (upper) name of the right series of plate 12, we reach Ehecatl, left (upper) name of the left series, same plate; twelve more to Quauhtli, left (upper) name of the right series of plate 11; twelve more to Tochtli, left (upper) name of the left series, same plate; and twelve more to Cipactli, the beginning. This proves that the reading is to the left and upward, and that from a day in one section to the corresponding day in the next section an interval of twelve days is to be reckoned.

The arrangement on plates 5 to 10 (inclusive) is the same, except that the days in the upper line follow one another in regular order without any interval and that the counters belonging to the lower line vary. The movement here is backward, as before. By this series, counting as indicated, we are enabled to determine that the unusual symbol (figure 4) on plate 6 is that of the day Itzcuintli, and the symbol (figure 5), same plate, is that for the day Ocelotl. Plate 5 appears to be connected backward with plates 4, 3, and 2 by the lower series, column to the right. The counter in the lower half of plate 5 is 9, and the lowest day of the column at the right is Cipactli. Counting nine intermediate days from this brings us to Ozomatli, the first or lowest day of the column in the lower half of plate 4; the counter here is 3, and passing over this number of days brings us to Quauhtli, lowest day of plate 3; here the counter is 16, which carries us to Malinalli, lowest day in plate 2, and eight days more to Cipactli, the commencement.

This lower series of plates 10 to 2 (inclusive) if to be considered as one, embraces one hundred and four days, not an even twenty, but exactly eight thirteens.

The upper series of plates 4 and 3 has five days to each section arranged in the same manner as the column in the lower half. The counters here are small black dots, 12 to each section. Counting this number from Cipactli, the day at the right of the right-hand section of plate 4, brings us to Ocelotl, right of left section; twelve more to Mazatl, etc.

The dots or little circles used as counters in this codex are, with the exception just named, colored blue, red, green, and yellow, those of different colors being found in almost every number. There is no tendency shown to arrange by fives, though plates 23 to 40 (inclusive) are largely filled with number symbols, short black lines (fives) and dots, as in the Mayan writings. So far I have been unable to determine the use of these numbers in the connection they are found.

Vatican codex—Plates 81 to 90 of this codex (Kingsborough, vol. III) are, as is shown by the numbers and day symbols, to be read as follow: The upper line, containing day symbols each followed by the counter 3,

in regular succession from left to right throughout; the lower, where the numbers are unaccompanied by day symbols, from right to left, beginning on plate 90 with the number 2, to plate 81, where the number is 26. The upper line is simple and easily followed, and, counting the days, embraces four twenties. To what the numbers in the lower line—which follow in regular succession, 2, 3, 4, etc.—refer is as yet unknown, though it seems they have some relation to 13; and why they begin with 2 is also without satisfactory explanation.

Plates 91 to 96 are to be taken from left to right, according to the paging. The counters in the middle express the intervals between the left-hand day of the lower line of one plate and the left-hand day of the lower line of the next plate, etc. The same is true also of plates 72 to 75.

Borgian codex—As the only object in view at present is to illustrate the use of numbers in the Mexican codices, and not to introduce attempted explanations of the figures, I give a few illustrations from the Borgian codex, which is probably the oldest of the existing Nahuatl manuscripts. Neither in this nor in the two last codices to which I have referred does there appear to be any indication of a tendency to arrange the counters in groups of 5. Where it is practicable—that is, where the number is not too great—they are placed in a single straight row, but the arrangement is governed by the space.

We turn to plates 18 to 21. Here the pages are arranged in two divisions, an upper and lower, each having a row of day symbols running along its lower edge; in the upper division the large red counters are placed in a column at the right of each page, and in the lower at the left. With two exceptions (upper divisions of plates 20 and 21) there are six counters in each column; in the exceptions there are 4 in a column. Starting with Cipactli, right of lower division plate 21, passing over six days we reach Tochtli, at the right of the lower division of plate 20, and so on to Ehecatl, at the right of the lower division of plate 18. Counting six more takes us to Atl, at the left of the upper division of plate 18; six more to Cozcaquauhtli, left of the upper division, plate 19; six more to Calli, plate 20, and four more to Tochtli, left of the upper division of plate 21. Counting four days from Cozcaquauhtli to the last day of the upper division of this plate brings us back to Cipactli, the beginning, the sum of the days being 52, or 4×13.

The 12 large red counters in the upper division of plate 17 express the number of intervening days between a day of the right section and a corresponding day of the left section, the counting being always forward in the calendar. The red counters on plate 58 indicate the interval between the corresponding days of the different sections in the order in which they follow one another. Commencing with the right section

of the lowest division, the movement is to the left up to the middle division, then to the right up to the upper division, and then to the left. The 12 large red counters of plate 59 denote the interval between the days of the two columns, commencing with Cipactli in the lower right-hand corner, and passing to the lower day in the left column, to the second (next to the lower) in the right column, to the second in the left, and so on throughout. The 12 red counters (plates 63 to 65) denote the intervals between the corresponding days in the lower line of the pages in the order in which they follow one another; that is, from right to left, beginning with plate 65. But in this instance the count includes the beginning or ending day.

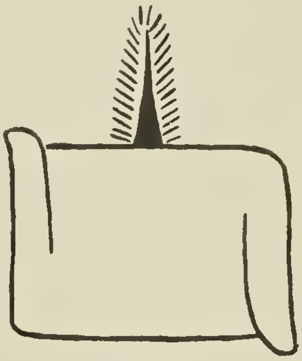


FIG. 28—Symbol for 400. Mendoza codex, plate 20, figure 16.

This will suffice to illustrate the use of the counters in the Mexican codices in connection with days, so far as it has been ascertained.

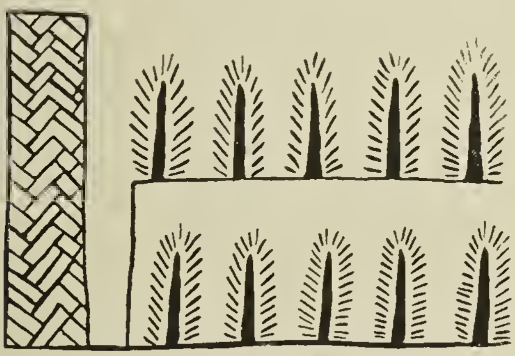


FIG. 29—Symbol for 4,000. Mendoza codex, plate 28, figure 24.

The higher numbers are represented in the Mexican codices by a different class of symbols from those which have been noticed, but for the explanation of these we have to rely wholly upon the interpretations made by early Spanish authorities and based upon the statements of native priests. The first to which reference will be made are found in the Mendoza codex, in Kingsborough, vol. I, the original Spanish explanations being given in volume 5 of the same work. As the different symbols for these higher numbers are not numerous, it will only be necessary to present a sufficient number of examples to illustrate the forms of the symbols and their use.

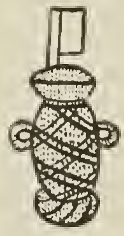


FIG. 30—Symbol for 20 jars of honey. Mendoza codex, plate 38, figure 21.

Mendoza codex—Plate 20, figure 16, shown in our figure 28, is interpreted 400 loads of great mantles, the number symbol being the fringed spike or leaf on top.

Plate 28, figure 24, shown in our figure 29, is interpreted 4,000. This is correct, counting each spike as 400.

Plate 38, figure 21 (our figure 30), is interpreted 20 jars of honey.

Plate 39, figure 20 (our figure 31), is interpreted 100 (that is, 5×20) hatchets of copper.

Plate 19, figure 2 (our figure 32), is interpreted 20 baskets of ground cacao ("cestos de cacao molido"); but it is evident that the number indicated by the symbols is 20×400×4 or 32,000. The reference therefore is to the grains or beans, each basket containing, or supposed to contain, 4×400 or 1,600 grains or beans.

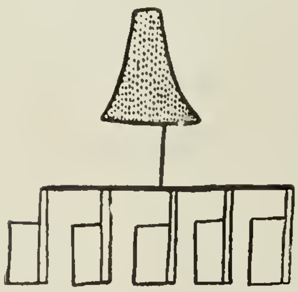


Fig. 31—Symbol for 100 hatchets. Mendoza codex, plate 39, figure 20.

Plate 19, figures 10, 11, 12, 13 is our figure 33: These four vari-colored circles, which are spoken of in the interpretation as flowers or as flower like, denote 80 days, each circle indicating 20 days.

Fig. 32—Symbol for 20 baskets. Mendoza codex, plate 19, fig. 2.

Plate 25, figure 11 (our figure 34) is interpreted 8,000 sheets of paper of the country ("pliegos de papal de tierra"). The reticule-shaped figure is the number symbol; this is evident from the next example.

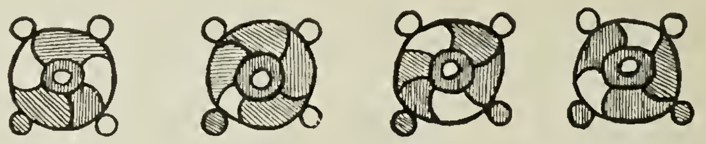


Fig. 33—Symbols for 20 days. Mendoza codex, plate 19, figures 10, 11, 12, 13.

Plate 38, figure 35 (our figure 35) is interpreted 8,000 pellets of copal for refining, wrapped in palm leaves.

Plate 44, figure 34 (our figure 36) is interpreted 200 *cacaxtles* ("sorte de crochet en bois pour porter des fardeaux," Siméon); I would explain it as a hand barrow! It is doubtful whether there is any numerical symbol here.

Fig. 34—Symbol for 8,000 sheets paper. Mendoza codex, plate 25, figure 11.

Codex Telleriano-Remensis plate 25 (Kingsborough, vol. I; explanation, vol. V). The figure in the lower left-hand portion of this plate represents a mass of people overwhelmed by a flood; the explanation says in consequence of an earthquake. The number symbol is reproduced in our figure 37. It

Fig. 35—Symbol for 8,000 pellets copal. Mendoza codex, plate 38, figure 35.

denotes 1800, that is $4 \times 400 + \frac{400}{2}$. The $\frac{400}{2}$ or 200 is indicated by the half leaf or spike at the right.

Vatican codex, number 3738 (Kingsborough, vol. II; explanation, vol. V)—On plate 7, figures 2 and 3, are the symbols shown in our figure 38, interpreted 4008 and supposed to refer to the years of the second age of the world. Each one of the crossed and fringed circles (blue in the original) represents 400 and is an equivalent and perhaps a mere variation of the fringed spike-like leaf. The 8 is represented by the upper row of smaller circles (also blue). We add one more of this type from plate 10 (see our figure 39). This is interpreted 5042; this, however, is a mistake; the correct number according to the symbol is $5206 = 13 \times 400 + 6$. Attention is called to this mistake in a note to the English translation of the explanation in Kingsborough, vol. VI, but the correct number is not stated.

Fig. 36—Symbol for 200 cacaxtles. Mendoza codex, plate 44, figure 34.

Fig. 37—Symbols for 1800. Codex Telleriano-Remensis, plate 25.

We find on plate 123 the combination shown in our figure 40. Although no interpretation of this page is given, the symbols clearly signify $2 \times 8{,}000 + 9 \times 400$ or 19,600. To what the numbers refer is uncertain, but probably to warriors.

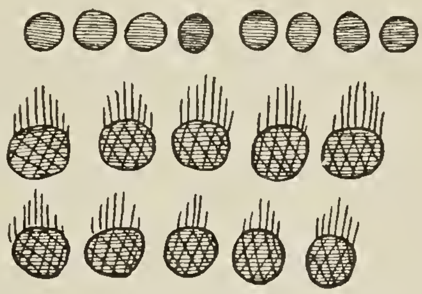


Fig. 38—Symbol for 4,008. Vatican codex 3738, plate 7, figures 2, 3.

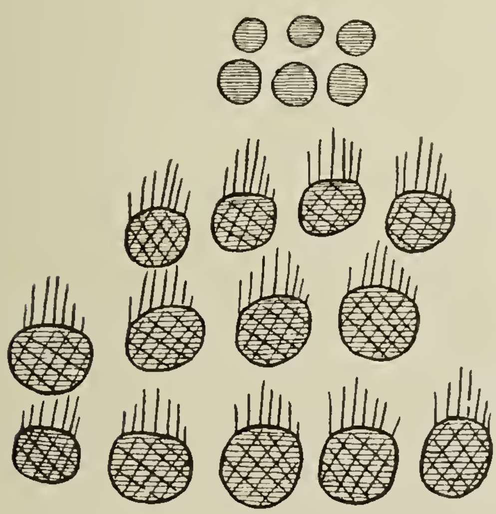


Fig. 39—Symbol for 5,206. Vatican codex 3738, plate 10.

These are all the types of numeral symbols, except the combined short lines and dots found in the codices, which are known as such and have been determined, and are all that Clavigero gives. There are reasons for believing that there are some others, but there are no means known by which to determine the point. Although the value of the various groups of short (black) lines and dots can easily be

determined, their application and use in the connections in which they are found has not been ascertained.

It is apparent from the data presented that the Aztec or Mexican

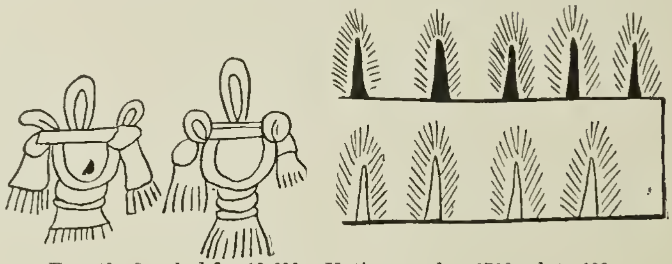


FIG. 40—Symbol for 19,600. Vatican codex 3738, plate 123.

tribes by whom the codices were made were not so well advanced in mathematics and time count, or in the symbolic designation of numbers, as the Mayan tribes.

THE MYSTIC AND CEREMONIAL USE OF NUMBERS

In taking up this branch of the subject we enter upon a field where the evidence must be drawn very largely from the early (chiefly Spanish) authorities; their testimony is, however, corroborated to some extent by the codices and inscriptions. As there is no intention of entering at this time upon a general discussion of the subject of the mystic and ceremonial use of numbers among the Mexican and Central American tribes, but simply of presenting the data so far as they may seem to have relation to the subject treated in this paper, this part will be brief.

As 2 is a number connected in some way with almost every action of life, and necessarily referred to in almost every ceremonial and mystic rite, it is difficult to determine where it is specially referred to because of its numeral value. I therefore omit it from consideration in this respect. Three is a number so seldom brought into use in the customs of the natives of the regions mentioned that it may be passed over.

Reference to the number 4 in myths and ceremonials as well as in other relations by savage tribes, as also by peoples of more advanced 'ture, is so general and so well known that it requires no proof here. This, as is well understood, arises to a large extent from the universal custom of considering the horizontal expanse with reference to four cardinal points, governed primarily by the rising and setting of the sun—east and west—the midway points on the circle being the north and south. The number, even outside of any process of counting, would become apparent in any figure or structure in the form of a square, the four sides and the four corners; and in the personal relations, front and back, right and left, as is suggested by Professor

McGee. And this would be true even in advance of a number system. The number 4 was therefore one which would naturally become prominent, and would necessarily become connected with the recognition of the cardinal points. The "Cult of the Quarters" in mystic and ceremonial rites was therefore a natural outgrowth of the recognition of these points.

This Cult of the Quarters and recognition of the number 4 appears to have been carried almost to the extreme limit among the Mexican and Central American tribes. Reference to the cardinal points appears hundreds of times in the Mexican and Mayan codices, and reference to the number 4 is scarcely less frequent. In the latter, as in the Troano codex, on plate after plate the symbols of the cardinal points are placed in the four corners of the sections around the main central figure, indicating, as we may reasonably presume, that reference to these points is made in the ceremony to which the figure relates. In the Mexican codices they are referred to in several ways, sometimes, it would seem, almost unconsciously, from the mere force of habit. Several plates of the Borgian codex—which is probably the oldest of the series—are crowded with figures referring to the quarters and with symbolic representations of them, some plates being devoted entirely thereto. For example, three out of the four chief figures of plate 4 are evidently drawn with direct reference to these points, and the large figure on plate 7 is devoted to the same cult, this being indicated in the figure in different ways, as by colors, figures, four-day symbols, etc. Reference to this cult, or to the number 4, is also distinctly seen in plates 9, 10, 11, 12, 13, 14, 43, 61, 71, 72, 73, 74, and 75.

Four is a prominent number in the time systems of the Mexican and Central American tribes. The years are arranged in four series, each with its dominical day. The Mexican cycle of fifty-two years consisted of four thirteens or four weeks of years, and according to the mythology of the same people the world has passed through four ages. In both Mexican and Mayan mythology the culture heroes appear as four brothers.

This number also occurs so frequently in other connections as to show that it had with the native population a mystic significance. For example, it was believed by the Mexicans that the end of the world would happen on the day 4 Ollin, and in accordance with this belief the "Feast of the Lords" lasted four days, beginning with 1 Ocelotl and ending with 4 Ollin; and other great feasts usually continued four days. The cross appears also to relate to the cult of the quarters, especially such as the four-colored St Andrew's cross on plate 70 of the Borgian codex. The Mexicans also assigned four gods as rulers over the inferno. It is stated in the Maya Chronicles, where they speak of the coming of the Tutulxiu, that there were four. The Cakchiquels, according to their Annals, consisted of four subtribes or clans, though

there were thirteen divisions. The same Annals, alluding to the origin of the people, speak of four men (leaders), four Tulans or traditional homes, and four rulers. The great Mexican festivals occurred on the fourth, thirteenth, and fifty-second years. Four arrows were placed in the hand of their great deity, Huitzilopochtli. At the great feast symbolizing the death of this deity four of the chief priests officiated and four youths were chosen as attendants.

The Guatemalans recognized four culture heroes; at Cholula, four disciples of Quetzalcoatl were charged with the government; in Tlaxcalla, four princes formed the supreme council; and finally, according to Brasseur, almost all the villages or tribes of Mexico were divided into four clans or quarters. According to the Popol Vuh, in the descent to Xibalba (Inferno?) four roads were encountered; one of these was red, one black, one white, and one yellow. And Gucumatz, in his ascent to heaven and descent to Xibalba every seven days, underwent four changes in form, becoming first, a serpent; next, an eagle; next a tiger, and last, coagulated blood.

This number and 5, together with the product of 4 and 5, 20, form the base and scaffolding of the Mexican and Mayan numeral and time systems, though two other factors, 13 and 18, were brought into the latter.

Although the number 5 does not appear to have entered so extensively into the mythology and ceremonials—that is to say, in so many different relations—as the 4, yet in some respects it was more prominent. For example, there is scarcely a page of the Troano, Dresden, or Cortesian codices without from one to four groups (usually columns) of five days, arranged in some regular order, which bear some relation to the accompanying symbolic figures and numerals. Similar groups of five days frequently occur in the Mexican codices, where they also bear some relation to the accompanying symbolic figures. The day symbols in the Tonalamatl, as found in three of these codices, are arranged in 5 lines of 4 times 13 days each.

The use of this number with a mystic or mythological significance appears to be shown on several plates of the Mexican codices, as for example, on plates 11 and 12 of the Borgian codex. On each of these plates are five scenes or groups of figures in five sections, placed as is shown in the diagram (figure 41).

The fact that the chief symbolic figure in each is the Rain god, Tlaloc, and that the lower portion of each section apparently denotes earth and vegetation growing therefrom, renders it probable that there is some reference here to the seasons or the vicissitudes of cultivated plant life. Be this as it may, the reference to five is apparent, not only from the number and position of the sections, but also from the colors of the Tlalocs on plate 12, one of the outer four being red, another blue, another yellow, and another black, while that in the center is striped with red and white.

One thing worthy of notice in this diagram (figure 41) is that one of the five figures is placed centrally, at the expense of the four outer squares. We have in this, it seems, evidence of reference to the four quarters and the center. What is to be understood in these figures by the "center" is somewhat uncertain. It may be simply a convenient way of locating the fifth symbol, which is in all probability the correct explanation in some cases, but even here it may have arisen, as is suggested by Professor McGee, through reference to the Ego in considering the quarters, giving rise to the quincunx. The same concept is symbolized on plate 4 of the Borgian codex, where we see four outer colored squares and a central colored circle, the Cipactli figure over which the latter is placed symbolizing the earth, and the dark outer border surrounding the whole figure denoting the clouds or sky. The central circle may in this case indicate the sun, which we find clearly represented on plate 43 of the same codex, though what seems to be the corresponding figure on plate 24 of the Vatican codex is without any central symbol. In some of the figures indicating the quarters, as one on plate 4 of the Borgian codex, where the four winds are represented, the center is occupied by a human form. In another place where wind symbols occupy the corners a death's-head is placed in the center.

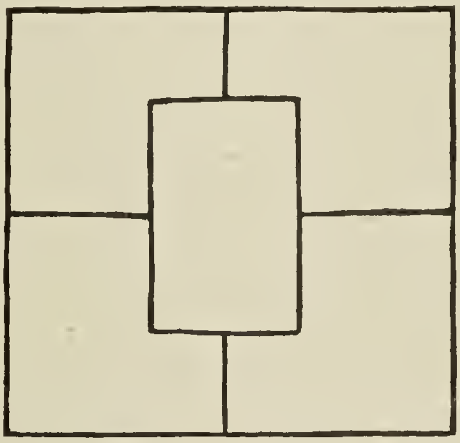


Fig. 41—Diagram of figures on plates 11 and 12 of the Borgian Codex.

It is proper, however, to bear in mind the fact that the arrangement of the days by fours and fives would follow as a necessary consequence of the time system. The year being divided into eighteen months of twenty days each, and five days being added at the end to complete the 365, each year would be five days in advance of that which preceded, and the years necessarily began on the same four days. The division of the twenty days of the month into four periods of five days would be a natural result. Why the five days of the columns in the codices are not in regular order according to this division, but are selected by skipping over regular intervals, is not so easily determined, though as has been shown in a previous paper, they usually have some reference the 260-day period.

The number 7, though playing a less important rôle than 4 and 5, seems to have had some significance in the mysteries and ceremonies of the Mexicans and Maya. Dr Brinton, in his Native Calendar says that the Tzental appear to have developed the number 7 as an arithmetic element in their astronomic system, as they had in their

calendars seven days painted with black figures, the first beginning with a Friday. This period was, however, probably based on the European week. That 7 would appear in the adjustment of the thirteen series to the twenty days of the month is evident; it is also noticeable that in some of the Mexican codices where the space is not sufficient to place thirteen day-symbols in a single series, where series of this length are referred to, the division is usually, though not always, into seven and six. However, the necessity of referring to seven in these instances does not appear to have brought it into use as a counter. Its appearance, therefore, in the time system and time count may be considered as accidental, or at least without significance. Nevertheless it does appear occasionally in relations where its use seems to be mystical. From the earliest times, the Cakchiquel, with perhaps others with whom they were related, are mentioned in their annals as "seven tribes" or seven villages arranged in thirteen divisions. Their sacred days were the seventh and the thirteenth. Tradition brings the ancestors of the Mexicans from seven caves; they come as seven tribes, the descendants of seven brothers. Among their gods was a deess named Centeocihuatl, also called Chicomecohuatl or the "Seven Serpents," who, it is said, nourished the seven gods who survived the flood. It is said in the Quiche legend (Popul Vuh) that Gucumatz, their great culture hero, ascended each seven days to heaven, and in seven days descended into Xibalba; that for seven days he took the form of a serpent; seven others that of an eagle; seven others that of a tiger, and seven others that of coagulated blood, as has been already mentioned. Among their mythical heroes was Vukub-Cahix ("Seven Aras"), and the ruler of Xibalba was Vukub-Came ("Seven Deaths").

The number 9, though seldom referred to in the ceremonials and mysteries, was not without a place therein among the Mexicans. They recognized nine "Lords of the Night." These are evidently referred to in the Borgian codex, as in the Tonalamatl, plates 31 to 38, where they are marked by footprints, and on plate 75, where the night is symbolized by the large black figure and the nine lords by nine star-like figures. It is stated in the Explanation of the Codex Telleriano-Remensis that he who was born on the day 9 Ehecatl would be prosperous as a merchant, while he who was born on the day 9 Itzcuintli would be a great magician. The Mexicans also recognized nine heavens. This number appears also to have had some significance among the Quiche, as they held that in each month there would be nine good and nine bad days, and two indifferent.

Next to 20, 13 was the most important number in the time systems of Mexico and Central America. Not only was it the number of days in their so-called week, but it was that by which the days were numbered. Although it did not form one of the regular time periods, as

the month, ahau, year or katun, the so-called week not being recognized as a regular period in their systems, it entered into almost every time count and every time series in the codices and inscriptions. It was one of the factors on which the so-called "sacred year" of 260 days and the cycle of fifty-two years were based.

Being so important in the time systems, it would be expected to enter more or less into the activities of life; nevertheless it appears to have played a comparatively unimportant rôle as a mystic or ceremonial number. It was the custom of several Mayan tribes to arrange their armies in thirteen divisions. It appears in the Votan myth among the Tzental, where "thirteen serpents" are referred to; and among the Cakchiquel the day numbered 13 was considered sacred.

The number 20 is the base of the numeral system of the Mexican and Central American tribes, and it may perhaps also be correctly considered the base of their calendar system, although there are other necessary factors. Nevertheless 20 does not appear to have been used as a mystic number in rites and ceremonies, except so far as the calendar was made to serve divinatory purposes. Why twenty days were adopted as a time period and a division of the year has as yet received no entirely satisfactory explanation, though it is generally supposed that it was chosen because the arithmetical system of these tribes was vigesimal. That there is some connection between the two is quite likely, especially as this would seem to correspond with the probable order of the steps in the formation of the two systems. That the formation of the vigesimal system preceded that of the time system appears to be an absolute requisite, but the steps in the formation of the latter can not be assumed with the certainty which we may have with regard to the former.

That the custom of grouping the days by fives did not begin until 20 had come into use is clear. Did the introduction of 13 as a factor precede or follow the adoption of 20? Dr Brinton states in his Native Calendar that he is persuaded that this period was posterior and secondary to the twenty-day period. Although this opinion may be, and probably is, correct, the evidence on which to base it is not so apparent as to leave no doubt. It seems probable, as Dr Brinton suggests, that the twenty-day period was derived from the vigesimal number system, but this does not explain the origin of the peculiarities of the unusual time system, which seems to have reference to no natural phenomena save the earth's annual revolution. There are other peoples than those of Mexico and Central America who use the vigesimal system, but no others, so far as known, who adopt the twenty-day month or eighteen-month year. The moon's revolution is the factor on which the month in most of the world's time systems is based, and the name for month in most, or at least several

of the Mayan tongues, is the same as that for moon. This is also true of the Zapotec language, and Cordova (Arte Idioma Zapoteco) says that the people of this tribe even count by moons; however, the latter statement may apply to post-Columbian times. The names for month and moon are the same in Cahita, Othomi, and Zoque. This fact, and the further fact that substantially the same term has passed over, in some instances, from one linguistic family to another, as the Zapotec, *peo* or *beo;* Zoque, *poya;* Kakchi (Mayan), *po* or *poo*, would seem to indicate an original lunar month. It is also true that the oldest inscriptions and the Dresden codex refer to a year of 365 days. However, against this evidence must be placed the fact that all the inscriptions and codices base the time count on the twenty-day month, and the day numbering on 13, the latter also being a factor in other counts of the inscriptions and codices. The oldest evidence, therefore, to which we can appeal where numbers are used, agrees with the time system of the "native calendar."

That a change from a lunar count to a twenty-day period could have been made otherwise than arbitrarily seems impossible; we can not conceive how the one could have grown out of the other. This must have been true or the system must have developed with the growth of the number system; at least no other supposition seems possible unless we assume that two time systems, a secular and a sacred one, were in use at the same time, and that the latter finally obscured the former. This seems to have been the case with some tribes. If the supposition that the time system developed with the number system be correct, then the lunar period could never have been a factor. It is somewhat strangely in accordance with this supposition that the moon, so far as the aboriginal records and early authorities show, is almost wholly absent from the codices, and does not appear, so far as is known, in the inscriptions.

Notwithstanding this negative evidence, I can not believe that a time system without reference to the lunar periods could have developed among the tribes of the region of which we are treating. My conclusion is, therefore, that the priests at an early date adopted a method of counting time for their ceremonial and divinatory purposes which would fit most easily into their numeral system, and that this system, in consequence of the overwhelming influence of the priesthood, caused the lunar count to drop into disuse. Moreover, the only native records which are available are those made by the priests for their purposes. This will probably account for the introduction of the twenty-day period, but does not account for the introduction of the 13.

Dr Förstemann suggests that at one time the Mayas arranged the days of the solar year in four groups of seven weeks each, the week consisting of 13 days, the year being then counted as 364 days (4×13

×7=364), and that each of the four groups was assigned to a particular cardinal point. Although it is true that the Tonalamatl, as given in some of the Mexican codices, seems to show, by the upper and lower border lines, which contain 52 figures each, some indications of a year of 364 days, this does not account for the introduction of the 13; moreover, Dr Förstemann's explanation introduces the factors 7 and 91 (7×13), and 7 and 28 (4×7), which are not found in the time counts of the codices or inscriptions. However, it is possible that the 28 (4×7) may be supposed to indicate the true lunar period, and the 4 times 7 the four changes of the moon. Mr Cushing suggests another explanation based on his observations among the Zuñi. In the ceremonies of this people the complete terrestrial sphere is symbolized by pointing or blowing smoke toward the four cardinal points, to the zenith and nadir, the individual making the seventh number. When the celestial sphere was symbolized only the six directions were added to the seven, no further reference to the individual being made. Thus 13 typifies the whole universe. While this explanation seems plausible, we lack the evidence that such a custom was in vogue among the people using the native calendar, nothing suggesting it being stated in the authorities or indicated in the codices, unless in the so-called title-pages of the Troano codex and Codex Cortesianus, which are supposed by most investigators to be parts of one plate or series. There we find the four cardinal point symbols taken in one direction followed by two symbols, which Seler believes indicate the zenith and nadir; these are followed by the cardinal point symbols taken in the opposite direction, and these by three other symbols, two of which appear to be the same as the supposed zenith and nadir symbols. Unfortunately the third, which makes the thirteenth, is too nearly obliterated to determine its form. The number symbols 1 to 13 stand above these.

Other suggestions as to the reason of the use of this number as a factor in the time system have been offered, but, like those mentioned, they are not entirely satisfactory. That 13 was considered important by most of the tribes is true, and that it was used by some otherwise than in time counts is true, but why is as yet an unsolved mystery, nor is there any satisfactory evidence that it was preceded by the twenty-day period, though this is probable. Clavigero asserts that the Mexicans, in their computations of time, disregarded months and years, counting by thirteens, but he evidently means by this that 13 was used as the multiplier, and, like Goodman, evidently confounds the system of numeration with the time system. However, this will be discussed more fully in a subsequent paper relating to the native time system.

TUSAYAN FLUTE AND SNAKE CEREMONIES

BY

JESSE WALTER FEWKES

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By Jesse Walter Fewkes

INTRODUCTION

The Hopi or so-called Moqui Indians of Arizona are among the few surviving tribes of American aborigines which still retain an ancient ritual that is apparently unmodified by the Christian religion. This ritual is of a very complicated nature and is composed of monthly ceremonies the recurrence of which is precise as to time and place.

It must be remembered that these ceremonies are not performed at irregular intervals by well-to-do Hopi to cure sickness of themselves or their families. Among other Indians this motive is often the keynote of their rites, but while among the Hopi there are ceremonials which are directed to that end, and all the regularly recurring ceremonials are regarded as efficacious in healing bodily ills, they have primarily another purpose. Whether they originated as a preventive of disease, and in their primitive condition had the same intent as the rites of the Navaho shamans, is beyond the scope of this memoir. At present the ritual is performed for the purpose of bringing abundant rains and successful crops.

Two most important summer ceremonies in this elaborate ritual are the Snake dance and the Flute observance, and the former, from the startling fact that venomous reptiles are carried in the mouths of the participants, has achieved world-wide celebrity. It is thought by some white men to be the most important ceremony in the calendar, but anyone familiar with the Hopi ritual will recognize that these Indians have several other ceremonies more complicated, though far less sensational. Only the bare outlines of many of these ceremonies have yet been described, but enough is known to cause due appreciation of their importance in the Hopi system of religion. The Flute ceremony is one of these, and as it is closely connected with the Snake dance it is naturally considered in this connection.

With the accompanying description of the Snake dance at Mishongnovi the author completes his account of the general features of this ceremony in the five Tusayan pueblos in which it takes place, but this additional knowledge of the externals of the observance has by

no means exhausted the subject, as the translation of songs and prayers is yet to be made.

The existence of a Snake dance among the Hopi villages was called to the attention of ethnologists about fifteen years ago, and in late years it has been repeatedly witnessed and described in detail by many observers, but it is hoped that the additional light thrown on the subject by the present studies may further advance our knowledge and prove an aid to more important discoveries.

The present paper has been prepared from notes made at the Hopi pueblos in the summers of 1896 and 1897. At the time these studies were made the author was in charge of an archæologic expedition sent out by the Bureau of American Ethnology, and could give but little of his time to ethnologic investigations. It was impossible to follow the complicated secret rites of the ceremonies through their entire course, consequently this account is limited to those portions which are most obscure. The author studied with care the Snake dance at Mishongnovi and the Flute observance in the same pueblo, of which little was known save the altars. Studies of the latter were conducted in 1896 and of the former in 1897. Certain comparisons with the Walpi Flute ceremony, and new data obtained in 1896, are likewise introduced.

SNAKE DANCE AT MISHONGNOVI IN 1897

A detailed preliminary account of the Snake dance at Walpi in 1891 and 1893 has been given elsewhere,[1] and the general features of that at Shipaulovi, Shumopovi, and Oraibi, as observed in 1896, are also recorded in a previous publication.[2]

The Snake dance covers a period of at least sixteen days, nine of which are days of active ceremonies, secret or open. These nine days bear the following names: 1, Yuñya; 2, Custala; 3, Luctala; 4, Paictala; 5, Naluctala; 6, Sockahimû; 7, Komoktotokya; 8, Totokya;[3] 9, Tihuni.[3]

The author arrived at Mishongnovi on August 16 of the year named, on Totokya, the day preceding that on which the final dance occurred, and saw the public Antelope ceremony performed. He likewise witnessed the Snake race on the morning of the ninth day (Tihuni), and studied the altar of the Antelope priests, and certain of their sacred rites. The only kiva rite of the Snake priests which was witnessed was the snake washing on the afternoon of the last day.[4]

[1] Journal of American Ethnology and Archæology, vol. IV.

[2] Sixteenth Annual Report of the Bureau of American Ethnology.

[3] The author was present at Mishongnovi on these days.

[4] Other members of the party were Dr Walter Hough, of the National Museum, and Mr F. W. Hodge, of the Bureau of American Ethnology. It was found convenient to camp at the small spring to the east of the Middle mesa on the trail to Walpi. As this spring can be readily approached by wagons it is recommended as a suitable place for visitors who do not desire to remain in the pueblos overnight.

This article is a record only of what was seen, and lays no claim to completeness, introducing no rites which were not studied, even when there is ample proof of their existence (and the same may be said of the previously cited accounts of the Snake dances at Oraibi and the Middle mesa). Like the preceding accounts, it is simply a preliminary record to aid investigators in future studies until enough material has been accumulated to adequately fathom the meaning of the rites.

The portions of the Snake ceremony to which special attention was given were the altars, the washing of the reptiles, and the public Antelope and Snake dances. There still remain to be investigated several important episodes, such as the rites and songs about the altar. It is expected that this and other fragmentary contributions to the subject will lead to an exhaustive account of the Hopi Snake dance, which the author has had in preparation for the last eight years.

The only known description of the Snake dance at Mishongnovi (plate XLV) was published in Science in 1886, by Mr Cosmos Mindeleff, who witnessed the festival at the pueblo named on August 16, 1885, and saw the presentation at Walpi on the following day. He found the two performances "essentially the same, the only difference being in the greater number of performers at Walpi, and in the painting of the body." In a general way this is true, but there are important differences in the kiva paraphernalia and performances, which are characteristic and instructive in comparative studies of the dance. Mr Mindeleff noticed the sand altar, and gave a brief description of it without illustration. He confused the two kivas used, for he speaks of a sand altar in the "Snake kiva proper," or "easternmost kiva." The room where the Snake priests meet and where the reptiles are confined has no altar, which in Mishongnovi is always made in a neighboring room, the Antelope kiva. While observations on the public dance agree with Mindeleff's descriptions, there are significant differences in interpretation, due to enlarged acquaintance with the Hopi ritual. "The Snake gens," he writes, "has nothing to do with the dance, and contrary to the opinion of Captain Bourke it is not referable, I think, to ancestor worship, at least not directly." On the contrary, no one can now doubt that the Snake dance was primarily a part of the ritual of the Snake clan, and that ancestor worship is very prominent in it. We need only look to the clan relation of the majority of priests in the celebration to show its intimate connection with the Snake clan, for the Snake chief, the Antelope chief, and all the adult men of the Snake family participate in it. The reverence with which the ancestor, and particularly the ancestress, of the Snake clan, viz, Tcüamana, is regarded, and the personation of these beings in kiva rites, certainly gives strong support to a theory of totemistic ancestor worship.

The reptiles used in the dance are collected on four successive days; the Antelope and Snake races, as well as several other episodes of the Mishongnovi ceremonial, are known to conform essentially to those at Walpi, before described.

The Mishongnovi Antelope Altar

The two kivas at Mishongnovi occupied by the Antelope and Snake societies lie not far apart, on the side of the village facing west. The one to the left, as one looks at them from the housetops, was occupied by the Snake priests; that to the right by the Antelope priests. Like all Tusayan kivas, these chambers are separated from the houses, and are rectangular in shape. They are subterranean, with an interior arrangement quite like those of Walpi. The Antelope and the Snake kivas are the only ones in Mishongnovi which the author visited, but Mr Victor Mindeleff mentions the names of five, and Mr Cosmos Mindeleff speaks of three. Evidently, if these enumerations be correct, some of the chambers have been abandoned within a recent period.

The Antelope altar at Mishongnovi (plate XLVI) resembles that at Walpi,[1] Oraibi, Shipaulovi, and Shumopovi[2] in its essential features, but there are differences in detail. There was no altar in the kiva used by the Snake priests in this pueblo, and this was also true in the other Hopi pueblos, except Walpi. The dual wooden images of Püükoñ and the female counterpart in the Oraibi[3] Snake kiva are not in themselves an indication of an altar; for the essential object in a Snake altar is the Snake palladium, or tiponi, which does not exist in this pueblo, and, indeed, is found only at Walpi.

The number of tiponis, or chieftain's badges, which are placed on the altars of the Antelope priests varies in the Hopi pueblos. Walpi and Oraibi have two; Shipaulovi and Shumopovi, one each. There are two tiponis on the Antelope altar at Mishongnovi, both of which are carried by Antelope chiefs in the public dances. Neither of these corresponds with the Snake tiponi of the Walpi chief, who has the only known Snake tiponi. The position of the two tiponis on the altar is characteristic, for they stand one on each of the rear corners of the sand picture, and not midway in the length of the rear margin, as at Oraibi and Walpi.

The sand picture of the Antelope altar at Mishongnovi resembles that of the other Antelope societies. Its border is composed of four bands of differently colored sand—yellow, green, red, and white—arranged in the order given from within outward. These marginal bands correspond with the cardinal points and are separated

[1] Snake ceremonials at Walpi, Journ. Amer. Eth. and Arch., vol. IV.
[2] Tusayan Snake ceremonies, Sixteenth Annual Report of the Bureau of American Ethnology.
[3] On certain years an altar is said to be introduced in initiations.

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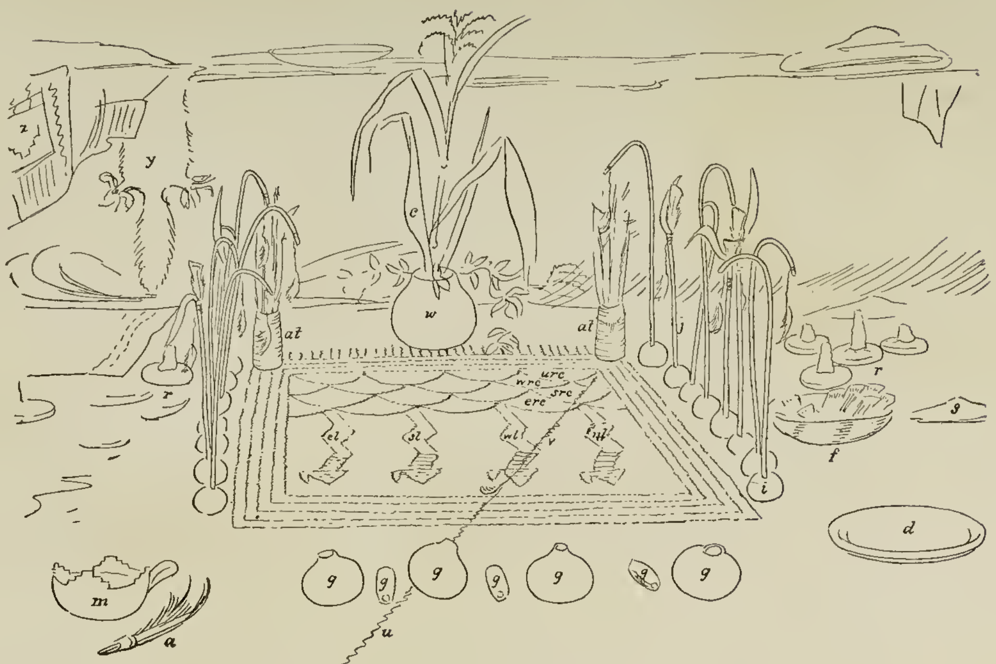
ANTELOPE ALTAR AT MISHONGNOVI



Antelope altar at Mishongnovi (key to plate XLVI)

a, Aspergill.
at, Antelope tiponi.
c, Corn stalks.
d, Tray of prayer-meal.
f, Basket full of prayer-sticks.
g, Four water gourds, with three ears of corn.
i, Clay pedestals.
j, Crooks (ceremonial bows).
m, Medicine bowl.
r, Rattles of Antelope priests.
s, Pile of sand for spittle.
u, Meal pathway.
v, Feather attached to a string.
w, Vase containing corn and bean stalks.
y, Fox skin worn by Antelope priest.
z, Kilt worn by Antelope priest.
urc, North rain-cloud figure.
src, South rain-cloud figure
wrc, West rain-cloud figure.
erc, East rain-cloud figure.
nl, North lightning-snake figure.
wl, West lightning-snake figure.
sl, South lightning-snake figure.
el, East lightning-snake figure.

by black lines. In the inclosed field, which is white, there are four sets of semicircles of the same colors, each with four members also separated by black lines, and on the border there are a number of short parallel lines. These semicircles represent rain-clouds, and the parallel lines, falling rain.

The semicircular figures occupy about one-third of the inclosed field, and in the remainder there are four zigzag designs representing lightning, as snakes, colored yellow, green, red, and white, with black rims. Each lightning symbol has a triangular head, with two dots for eyes and parallel marks for a necklace. Appended to the head of each is a horn.

On each side of the sand picture a row of sticks are set upright in clay pedestals. These sticks, like those at Oraibi, are straight, and not crooked at the end, as at Walpi. On the last day of the ceremony it is customary for the Antelope priests to hang the bundles of feathers which they wear on their heads on these sticks, as is shown in the picture of the Walpi altar (plate LIII). The straight sticks probably represent arrows, and possibly, when curved at the end, primitive implements of war, allied to bows, for the propulsion of arrow-like weapons.[1]

Back of the sand painting, about midway in the length of the rear margin, and slightly removed from it, was a small vase containing cornstalks and gourd vines. This vase is called a "patne" and corresponds with that which the Snake-girl at Walpi holds in her hand during the dramatizations of the Snake legend, elsewhere described. Unfortunately there is nothing known of the part this vase plays in the secret exercises in any pueblo but Walpi; yet it probably has a similar rôle in all. It may be said, in passing, that a similar vase is found on all Antelope altars, even the simplest; and there is no known Antelope altar where cornstalks and vines are absent on the last days of the ceremony.

Four spherical netted gourds were placed at equal intervals along the front margin of the sand picture. These gourds, which were later carried by the Antelope priests in the public dance, are represented at Oraibi by a row of similar objects on each side of the altar. Between each pair of these gourds there was an ear of corn, as is shown in the plate. The author's studies have not proceeded far enough to enable him to connect these ears of corn with those of novices, which,

[1] The author's illustration of the Oraibi altar is faulty in representing these sticks crooked at the end. They are straight in this pueblo as well as at Shipaulovi, as was stated in the descriptive text in the Sixteenth Annual Report of the Bureau of American Ethnology, p. 279. In the Oraibi Snake (not Antelope) dance the priests do not carry these rods from the altar. The left hands of all, with the exception of the man who carried an ear of corn, of the chief, who had his tiponi, and of the asperger, who bore the medicine-bowl and aspergill, were empty. Thirteen of the sticks were counted on the left side of the altar, and there were probably an equal number on the right side. There were no stone images of animals on this altar, and the stone "teamahias" which are so conspicuous in the Walpi altar between the clay pedestals and the border of the sand picture were likewise absent. There were no sticks along the front of the sand picture as at Walpi, where, by their distribution, spaces or gateways are left in the altar.

ENTRANCE TO MISHONGNOVI SNAKE KIVA

at Walpi, are generally placed on a basket tray near the altar. It is possible that they belong to novices, but their fate when the altar was destroyed was not noticed. Four netted gourds were carried by the Antelope priests in the public dance.

In the public dance at Oraibi each Antelope priest carried one of these water gourds, while in the other pueblos, where the number of participants is smaller, only one or two priests bear these objects. At Walpi, for instance, the Antelope chief has one of the water gourds which is not conspicuous in the public ceremony. At the Middle mesa several gourds are used, while at Oraibi they form an important feature of the ceremonial paraphernalia, and it is probable that the conditions at Oraibi are nearer the ancient than at Walpi in this particular. A number of basket trays containing prayer-sticks occupied the whole space of the floor between the altar and the fireplace. This is similar to what is found at Shipaulovi, as shown in a figure of the altar of that pueblo.[1]

There is good evidence that the Walpi custom of making prayer-sticks of different lengths, corresponding to the length of finger joints, and of prescribing the days of their manufacture and the distance of the shrines in which they are deposited, is not followed at Shipaulovi, Oraibi, and Mishongnovi.

While there is a general similarity between the pahos made by the Antelope societies in all the Tusayan pueblos, there are differences in detail. One of the component sticks is provided with a flat facet, on which is painted eyes and mouth, forming a rude representation of a face. While this facet is absent from the Walpi Snake and Antelope pahos, the two sticks which compose the prayer-offering are regarded as male and female.

Snake Whips

On entering the Mishongnovi Snake kiva all the snake whips were found to be arranged in a row against a banquette at the end of the room. A similar arrangement has also been noticed in the Snake kiva at Shipaulovi, but there was no evidence of an altar or sand picture in the Snake chamber in either of the pueblos named. The snake whips are composed of two shafts, instead of one, with a corn-husk packet of meal tied about the middle. This would seem to indicate that the whips were regarded as prayer-sticks, and indeed this name (paho) is applied to them. During the ceremony of washing the reptiles a small "breath feather" of the eagle, stained red, is tied to the scalplock, but later this feather is detached and fastened by one of the priests to the end of his whip.

[1] Sixteenth Annual Report of the Bureau of American Ethnology, plate LXXI.

Snake-hunting Implements

It is customary for the Snake priests on the four snake hunts to dig out the reptiles from their holes with sticks and hoes. These implements are left on the kiva roof overnight, or while the priests are in the pueblos, and must not be carried to the homes of the owners until the close of the dance. There were noted at Mishongnovi many Hopi planting sticks, a number of American hoes, several old Mexican mattocks, and flat iron knives, also of Mexican manufacture, tied to sticks. At Walpi, Mexican implements have almost wholly passed out of use, but in the Middle mesa villages and at Oraibi they are still employed. The Snake chief would not part with one of these hoes during the ceremony, but had no objection to selling one or more of them after the festival.

Washing the Reptiles

One of the weirdest of the many features of the Snake ceremony in the Hopi pueblos is the washing of the reptiles used by the priests. This occurs in all the villages just after noon of the ninth day, and is preparatory to bringing the snakes to the public plaza, from which they are later taken and carried by members of the Snake society in the presence of spectators. The details of this rite, as performed at Walpi, have been described, but no one has yet recorded the variants of snake washing in the other four Hopi villages where it is celebrated.

In order to gather information in regard to snake washing in the other pueblos, the author attended the performance of this rite at Mishongnovi on August 17, 1897. The snake washing at Oraibi and on the Middle mesa pueblos is greatly modified by the absence of a sand altar such as exists at Walpi. In considering the reason for the absence of the Snake altars in these villages, a corresponding absence of a Snake tiponi or badge of chieftaincy is to be noted. Walpi, on the East mesa, is the only Hopi village that has a Snake tiponi.

Considerable time was spent before the snake washing began in getting the reptiles out of the four canteens in which they were kept when not moving about freely in the kiva. These canteens are of baked clay similar to those in which the women carry water on their backs to the pueblos from the springs at the base of the mesa. A hole is punched in the middle of the convex side, and both this and the opening at the neck are closed with corncobs. The reptiles were transferred with difficulty from these vessels to cloth bags, and were laid on the floor near the fireplace. A considerable quantity of sand was brought into the room and spread on the floor on one side of the kiva. A board was placed on a stone seat along the edge of this sand, down the middle of the kiva, and upon this board the Snake priests seated themselves, facing the sanded floor. They were closely

PHOTOGRAPH BY MAUDE AND JAMES

PLATOON OF ANTELOPE PRIESTS AT MISHONGNOVI

crowded together, completely surrounding the sand, save on one side, which was formed by the kiva wall (see figure 42). Three boys—novices—stood behind the line of seated priests, and if any of the reptiles escaped between the men while being released, they were promptly captured and returned to the sand by the lads.

The bodies of all the participants were naked and were stained red with iron oxide, and each man wore a small red feather in his hair. Before taking their seats they hung bandoliers over their shoulders and tied one to the ladder pole. One of their number tied a white buckskin over his arm, and added other paraphernalia characteristic

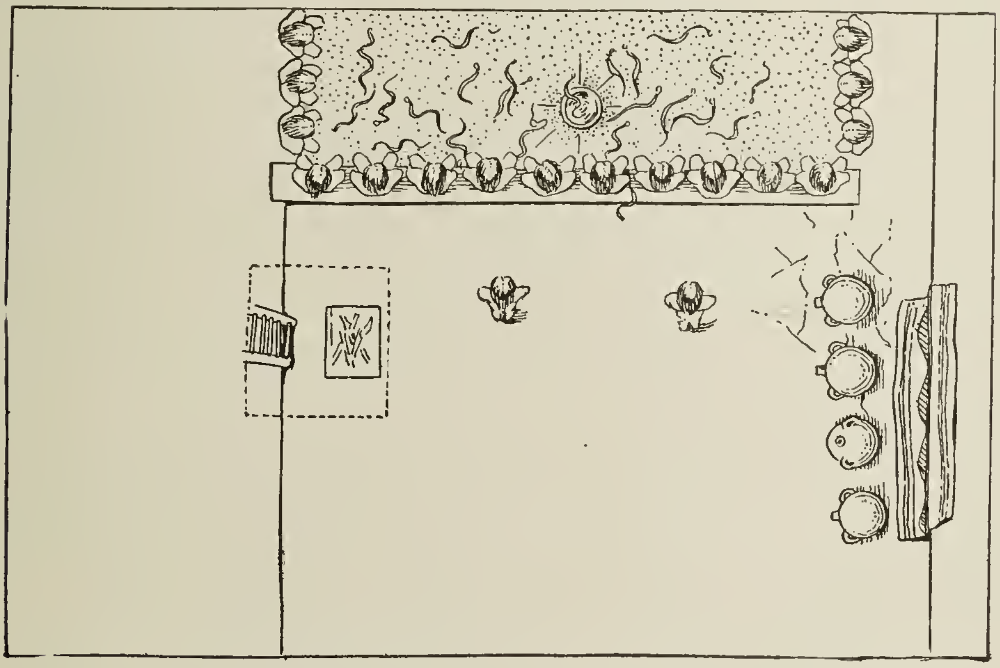


FIG. 42—Diagram of positions of celebrants in the snake washing.

of a kalektaka or warrior. It may be here noted that this personification does not appear in the Walpi snake washing.

Two Snake kilts were spread on the banquette at the end of the kiva, and leaning against one of these was a row of snake whips. One of these kilts was decorated with a complete figure of the Great Snake. Ordinarily the head is omitted from figures of this serpent on Snake kilts, but the Snake priest at the Keres pueblo of Sia, as represented in Mrs Stevenson's instructive memoir, wears a kilt decorated with a complete figure of the Great Serpent. The figure of the zigzag body of the Great Snake on the kilts at the Middle mesa and Oraibi has two parallel bars extending entirely across the design; in the Snake kilts used in Walpi these lines do not join the border, but are parallel with it.

The chief sat in the middle of the line and a man dressed as a warrior was at his side. The former first drew with meal on the sand before

him six short radiating lines corresponding to the six cardinal points recognized by the Hopi, and at their junction he placed a large earthenware basin similar to the kind used in washing the head. Into this bowl the chief poured liquid from a large gourd six times, each time making a pass in sequence to one of the cardinal directions. The remaining liquid was then emptied into the bowl so that it was about two-thirds full. Some object, an herb or root, which was not plainly seen, was next put into the liquid.

A formal ceremonial smoke followed, during which terms of relationship were interchanged among the men. When this had ceased prayers were offered by several of the priests, beginning with the Snake chief. The Snake men then took their snake whips and began a quick song resembling that of the Walpi society during a similar rite, and the priests took the reptiles from the bags and transferred them, three or four at a time, to the liquid. They were then laid on the sand, but were not thrown across the room, as at the Walpi snake washing. The object of placing the reptiles on the sand was simply to dry them, and they were left there for some time after their transference from the bowl of liquid. At the close of the rite the priests resumed the preparation of their dance paraphernalia, painting their kilts, and decorating their bandoliers with the shells which had been given them by the author.

The participants, even when the reptiles were free in the kiva, were not restrained by many of the prescribed rules of conduct which are so rigidly adhered to at Walpi. Members of the society did not lower their voices in conversation, and even loud talking was engaged in during the snake washing. No one at that time speaks above a whisper in the Walpi kiva, and loud conversation is never heard.

The wearing of their bandoliers by the Snake priests during the snake washing seems to be a survival of a primitive custom that has disappeared at Walpi, and the personation of a warrior by one of their number may have a similar explanation. It is interesting in this connection to note that in the Walpi celebration a similar warrior personator accompanies the Antelope priests, among whom he is conspicuous, but he does not appear associated with them in variants of the Snake dances which have been studied in other Hopi pueblos. In the Walpi snake washing, when the Snake chief deposits on the sand the bowl in which the reptiles are washed, he makes four raincloud symbols. At Mishongnovi the chief simply draws six radiating lines of meal, but it would seem that the intent was the same in both instances, the Middle mesa practice being perhaps more ancient. At Mishongnovi it was not noticed whether a bandolier[1] was placed under the basin in which the snakes were washed, as is the case at Walpi.

[1] Many of the bandoliers were decorated with rows c small cones, the spines of shells identical with specimens which are occasionally dug from r uins along Little Colorado river. The conus shell, from which tnese are made, is found in ruins along the Gila, and was used as an ornament, or, fastened with others to a stick, served as a rattle to beat time in rhythm with sacred songs.

THE KALEKTAKA AT WALPI

The idea which underlies the washing of the reptiles in the Snake dance is that of bodily purification or lustration, and probably sprang from a belief in a totemic relationship between reptiles and the Snake clan. It can be explained on the theory that the reptiles, as "elder brothers" and members of the same Snake clan, need purification by water as an essential act in preparation for the ceremonials in which they later participate.

On the morning of the ninth day of the Snake dance all priests of the Snake society and all members of the Snake clan bathe their heads in preparation for the ceremony. The reptiles, or elder members of the same clan, have been gathered from the fields and brought to the pueblo to participate in this the great festival of their family, and it is both fitting and necessary that their heads, like those of the priests, should be washed on this day. The ceremonial washing of the reptiles is therefore perfectly logical on the theory of totemic worship.

A few days after the snake washing at Mishongnovi, the author attended for the fourth time the snake washing at Walpi, finding that the rites presented no marked variation from those of previous years. The exercises at the Middle mesa, and probably at Oraibi, lack the dash of those of the East mesa, and are simpler in character.

The Snake priests of Walpi found it necessary to station one of their number at the hatchway, as a tyler, to prevent the intrusion of the uninitiated during the snake washing, and this will probably become a custom in future dances.

Public Antelope and Snake Dances

The public Snake dance at Mishongnovi (plate XLV) has been well described by Mr Cosmos Mindeleff.[1] It closely resembles that at Walpi, which it generally precedes,[2] and, next to that at Walpi, it is the most spirited performance of this ceremony among the Hopi. On account of their similarity it is hardly necessary to describe both the Antelope and the Snake dance, and consequently this account is limited to the latter, or to details in which differences exist.

A conical structure made of cottonwood boughs, and called a kisi (brush-house), was erected in the plaza near a central, permanent shrine of stone. The kisi served as a receptacle for the reptiles until they were needed, and was made in the following way: holes were dug in the ground at intervals in the form of a circle, and several good size, newly cut but untrimmed, green cottonwood boughs were planted therein. The upper ends of the boughs were bound together with ropes and straps, and a cloth was tied on one side covering an entrance into the inclosure. Smaller cottonwood branches were inserted between the larger ones, making a dense bower amply suffi-

[1] Science, vol. VII, number 174, 1886.

[2] In 1891, 1893, and 1895 it was celebrated the day before the Walpi dance, and in 1885, according to Mindeleff, the same relative day was chosen.

cient to conceal whatever was placed within. Shortly before the dance began a sack containing all the reptiles was deposited in the kisi by two Snake priests.

The public ceremony was ushered in by the appearance of the line of Antelope priests, headed by their chief, who carried his tiponi on his left arm. There were twenty persons in this procession, the rear of which consisted of four small boys. Next to the chief came an albino, likewise bearing a tiponi on his arm. The Antelope priests were dressed and painted as are those of Walpi, but the four small boys who closed the line wore very small kilts. In the 1885 celebration, according to Mindeleff, there were but ten Antelope priests in line. The increase in number is in accord with what has been observed at Walpi, where the number of participants has also increased in late years.

Each Antelope priest, except one to be presently noticed, carried two rattles, one in each hand, which is characteristic of two of the Middle mesa pueblos, but different from the custom at Walpi and Oraibi, where each Antelope priest carries one rattle only.

The third man in the line bore a medicine-bowl and an aspergill; he wore a fillet of cottonwood leaves, and was comparable with the asperger of the Walpi and other variants. He dipped his feathered aspergill into the medicine-bowl as he entered and left the plaza, and asperged to world-quarters and upon the Snake priests. Before the snake dance began, this man called out an invocation to warriors.

In an account of the Oraibi dance it has been noted that the words of this invocation, which have long been recognized as foreign to the Hopi language, were also used in Keresan songs at Sia pueblo. In the course of these new investigations direct inquiries were made in regard to the meaning of the words, and the identity of the personation by the man who utters them. The man who makes this invocation is believed to represent the Acoma relatives of the Snake people. There are several songs in Hopi secret rites, the words of which resemble closely certain terms of the Keresan language, in addition to the vocables common to sacred songs of all American Indians.

The line of Antelope priests made four circuits about the plaza, and as each member passed the shrine in the middle of the plaza, he dropped a pinch of meal upon it. The same act of prayer was repeated before the kisi when the priest stamped violently on a plank as he dropped the sacred meal. The Antelopes then formed a platoon at the kisi and awaited the Snake priests, who soon appeared, headed by the Snake chief.

When the Antelope priests had formed in a platoon in front of the kisi (plate XLVIII), it was noticed that the line was continuous and not broken into two divisions, a right and a left, as at Walpi. The first four men and the ninth man in line, counting from the left, were

PHOTOGRAPH BY MAUDE AND JAMES

WIKI, ANTELOPE CHIEF

barefoot, but all the remainder wore moccasins. There was some variation in the colors of the feathers on their heads, which can be interpreted in the same way as similar variations at Walpi, later considered; but it was noticed that certain of the priests failed to have the white zigzag markings on their bodies, so conspicuous in the Walpi celebration.

The entrance of the Snake priests into the plaza was not so animated as at Walpi under the leadership of Kopeli, but their circuits were the same, and their dress and adornment was quite similar in the two pueblos. The Snake priests filed about the plaza four times, stamped on the plank in the ground before the kisi as they passed it, and took their positions facing the Antelope priests. The ceremonies at the kisi began with a swaying movement of their bodies in unison with the song of the Antelopes, and, as it continued, the Snake priests locked arms, and, bending over, shook their whips at the ground with a quivering motion as if brushing a vicious snake from a coiled posture. These preliminary songs, with attendant steps, lasted about a quarter of an hour, at the close of which time the startling feature of the ceremony—the carrying of the reptiles about the plaza—began. This was one of the best presentations of the Snake dance ever seen in the Hopi pueblos.

One of the most conspicuous men in the line of Snake priests personified a warrior (kalektaka), who wore on his head a close-fitting, open-mesh, cotton skull-cap, which represents the ancient war-bonnet.[1] This warrior-personation entered the kisi, and there, concealed from view, held the neck of the bag in which the reptiles were confined to the entrance of the kisi, and as the imprisoned snakes were needed he drew or forced them from the bag to be taken by those outside.

The Snake priests divided into groups of three, each group consisting of a "carrier" who held the reptile in his mouth, a "hugger" who placed his left hand on the right shoulder of the carrier, whom he accompanied in his circuit about the plaza, and the "gatherer," who collected and carried the snakes after they were dropped. The reptiles were not handed to the Antelope priests to hold during the dance. As the priests circled about with the snakes in their mouths, two platoons of women sprinkled them with sacred meal from trays which they held as a prayer-offering. The Antelopes remained in line by the kisi, singing and shaking their rattles as the rite progressed.

At the close of the dance the chief made a ring of meal on the ground, in which he drew six radial lines corresponding to the cardinal points, and all the reptiles were placed within this circle. At a signal after a prayer the Snake priests rushed at the struggling mass, and seizing

[1] The wooden image, in the Oraibi Snake kiva, representing Püükoñ, has on its head the representation of one of these war-bonnets. The head of the female idol with the War-god has the terraced rain-cloud so common on female idols.

all the snakes they could carry darted down to the mesa side and distributed them to the cardinal points. A shower of spittle from the assembled spectators followed them, much to the discomfort of those who did not happen to be on the housetops. This habit of expectorating after those bearing important prayers is also noticeable in the Niman-katcina, or Departure of the Katcinas, and may be considered as a form of prayer for benefits desired. Before the reptiles which had been thrown into this ring of meal had been seized by the priests they crawled together and the girls and women threw what meal remained in their plaques upon the writhing mass. Some of the spectators were likewise observed to throw pinches of meal in that direction. This is a symbolic prayer which will later be discussed. After the reptiles had been seized by the Snake men and carried down the mesa, one or two persons, among others a Navaho woman, scraped up some of this meal from the ground. About sixty reptiles were used, of which more than a half were rattlesnakes.

The reptiles are carried in the mouths of the Snake priests at Mishongnovi in the same manner as at Walpi, hence the descriptions of the functions of carrier, hugger, and gatherer in the Walpi variant will serve very well for the same personages at Mishongnovi. With minor differences in ceremonial paraphernalia and symbolism, the public Antelope and Snake dances in the largest pueblo of the Middle mesa and at Walpi are identical.

One of the Snake priests did not obtain any of the snakes in the rush for them as they lay on the ground. He seized, however, a large snake which a fellow priest held and for a moment there was a mild struggle for the possession of it, with apparently some ill feeling. But at last he gave it up, and after his companions had departed he made several circuits of the plaza alone, each time stamping on the plank before the kisi, and then marched off. In an account of the termination of the Shumopovi Snake dance of 1896, a similar failure of Snake men to obtain reptiles at the final mêlée is mentioned. It is apparently not regarded an honor to depart from the kisi at the close of the dance without a snake, and in both instances some merriment was expressed by the native spectators at the man who had left the plaza empty-handed.

After the reptiles had been deposited in the fields the Snake men returned to the pueblo, took the "emetic," vomited (plate LI), and partook of the great feast with which the Snake dance in the Hopi pueblos always closes.

SNAKE DANCE AT WALPI IN 1897

Several of the more important features of the Walpi Snake dance were witnessed in 1897, and a few new facts were discovered regarding obscure parts of this variant. In the year named, the author sought

PHOTOGRAPH BY MAUDE AND JAMES

PARTICIPANTS TAKING THE EMETIC AT WALPI

especially to notice any innovations or variations from the presentations in 1891, 1893, and 1895, which might result from deaths in the ranks of the celebrants and the increase in the number of white spectators.

The kiva exhibitions were found to remain practically unchanged, and notes made in 1891 might serve equally well as a description of the rite in 1897, although the participants had changed. The mortality among the Antelope priests since the dance was first studied in 1891 has been great, among those who died being Hahawe, Nasyuñweve, Masaiumtiwa, and Intiwa—practically all the older members except Wiki. This has led in some instances to the introduction of lads to fill out the complement of numbers, and with them has come some loss of seriousness in the kiva exercises. For an unknown reason Hoñyi took the part of a Snake priest, and old Tcoshoniwû (Tcino), after several years of absence, resumed his rôle of asperger of the kisi. With the death of the older men of this society much ancient lore concerning the Snake-dance legend has been lost, for the boys who have taken their places are too young to understand or indeed to care much for the ceremony, even if its significance could be explained to them. Wiki, the Antelope chief (plate L), is so deaf that it is next to impossible to communicate with him on the subject, so that much of the Walpi Snake lore is lost forever.

Washing the Reptiles

The exercises in the Snake kiva during the washing of the snakes were practically identical with those elsewhere described, and therefore need not be repeated: but an exceptional event occurred at the end of the rite: One of the reptiles had crawled up the side of the room above the spectators' part and had hidden in a hole in the roof, so that only a small part of the scaly body could be seen. An attempt was first made to dig the snake out from the inside of the room, but as that was not successful some of the men went outside on the roof, and were obliged to remove some of the stones before the reptile was captured. It was finally brought down the ladder and washed with the others.

Supela was followed out of the kiva in order to note more in detail than hitherto what was done with the liquid in which the snakes had been bathed, and with the altar sand in which they had been dried (plate LII). He went through the western court of Walpi to the end of the mesa, and, standing on the edge of the cliff, poured a little of the water over it in four places. Although his explanation of this act was not very lucid, the rite is undoubtedly connected in some way with world-quarters worship. The bowl in which the snakes had been washed was later deposited, with the jars in which they had been kept,

in a crypt on the northern side of the mesa. As these jars must not be profaned by any secular use, they are deposited in a special cave, as is the figurine of Talatumsi used in the New-fire rites.

Influence of White Spectators

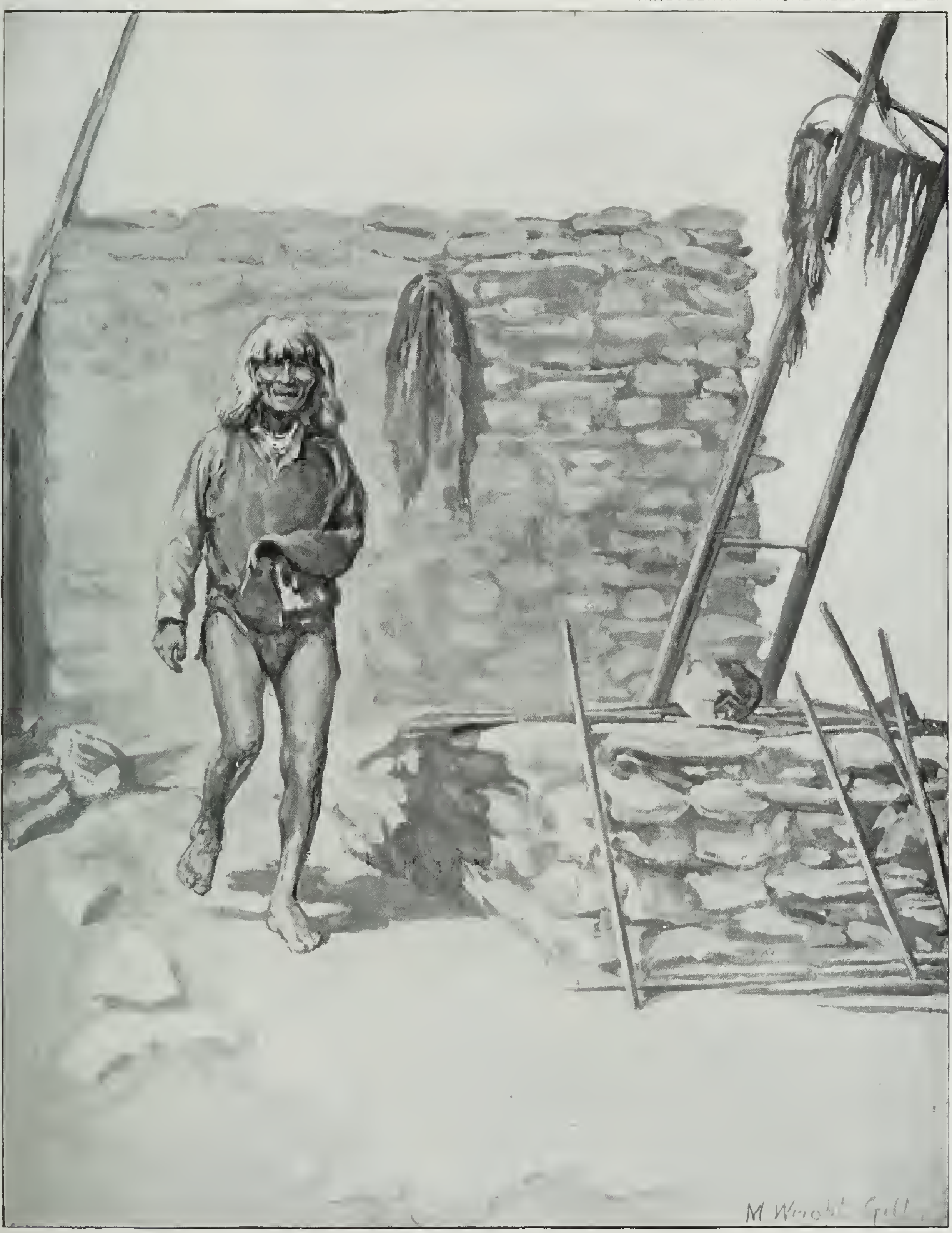
The number of white spectators of the Walpi Snake dance in 1897 was more than double that during any previous dance, and probably two hundred would not be far from the actual enumeration. An audience of this size, with the addition of various Navaho and the residents of Walpi and neighboring pueblos, is too large for the size of the plaza, and it became a matter of grave concern to those who are familiar with the mode of construction of the walls and roofs of the pueblo whether they would support the great weight which they were called upon to bear (plate LV). Happily these fears proved to be groundless, but if the spectators increase in number in the next presentations as rapidly as in the past, it will hardly be possible for the pueblo to accommodate them.

The influx of white spectators has had its influence on the native performers, for, when gazed upon by so many strangers, some of the Snake men appeared to be more nervous, and did not handle the reptiles in the fearless manner which marked earlier performances. The older members of the fraternity maintained the same earnestness, but the more youthful glanced so often at the spectators that their thoughts seemed to be on other subjects than the solemn duty before them, and they dodged the fallen reptiles in a way not before seen at Walpi. A proposition to perform the dance at Albuquerque, New Mexico, in 1897, was entertained by the young men, but was promptly refused by the chiefs. Germs of a degeneration of the religious character of the Walpi Snake dance have thus began to develop. When the old men pass away it may be that an attempt to induce the Snake priests to perform their dance for gain will be successful; but when that time comes the Snake dance will cease to be a religious ceremony, the secret rites will disappear, and nothing remain but a spectacular show.

Unusual Features

During the public exhibition of the Walpi Snake dance in 1897 several of the priests carried a tiny snake with the head protruding from the mouth like a cigar. Kopeli explained this by saying that he had found a brood of young snakes, but that they were not put in the cottonwood bower on account of their small size and the consequent difficulty in finding them. They were therefore held in the performers' mouths from the time they left their kiva.

The author's attention was called by one or two of the spectators to the fact that one of the Snake priests was bitten during the dance, but when the chief was asked for the name of the man bitten no information



SUPELA AT ENTRANCE TO WALPI SNAKE KIVA

in that respect could be elicited; he declared that no one had been bitten during the exhibition. One of the writer's party says that he saw one of the Snake priests with a small frog in his mouth, which is apropos of a statement by a responsible Indian that in former times other animals than snakes were carried by the priests in their mouths. Subsequent interrogations of the chief failed to make known the man who carried the frog in the way indicated.

Number of Participants

An enumeration of the participants in the last four performances of the Walpi Snake dance shows that the number is gradually increasing. The Snake society has become a very popular one, possibly on account of the increase in the number of visitors. Several young men of Walpi wish to join, and a man at the Middle Mesa declared that while he did not care to become a member of the Snake society of his own pueblo he would much like to be enrolled among the followers of Kopeli. The gradual increase in the number of participants certainly does not show a decline in the popularity of the Snake dance, or that it is likely soon to be abandoned. The religious element, in which the ethnologist has the greatest interest, will be the first to disappear. In all the Tusayan pueblos, save Walpi, the number of Antelope priests is about the same as that of Snake priests; but at Walpi there are over twice as many Snake as Antelope priests. It is evident that this predominance is due to the popularity of the society (since the clan is no larger in Walpi than in the other pueblos), and may be traced directly to the influx of visitors to witness the spectacular performance; but while the number of Antelope priests at Walpi has diminished, that of the Snake priests has steadily increased.[1]

Women Members of the Snake Society

The women members of the Snake society are so numerous that Kopeli did not pretend to count them or to be able to mention their names. They never take part in the public Snake dance, except by sprinkling meal on the participants, but join the society and offer their children for initiation as a protection against rattlesnake bites and for the additional benefit of the invocations in the kiva performances. There are also women members of the Antelope society, but they are not so numerous as in the Snake society. These women belong to several clans, and the membership of women in both societies is a survival of ancient times when all members (females as well as males) of the Horn and Snake clans were members of the Antelope and Snake societies.

[1] A count of the Snake priests in 1891 indicated 41, and there were 4 novices that year. The author omitted to note the number of novices in 1893, 1895, and 1897, but counted 50 Snake priests in 1897.

Photographs of the Walpi Snake Dance

During the last five performances the Snake dances in the Hopi pueblos have been photographed again and again, with varying success. Although the conditions of light at the time of the dance are poor, there has been a steady improvement at each successive presentation, and fine views can now be purchased from various photographers. The author has made a collection of these views, most of which were presented by the photographers, and has selected some of the more instructive for illustration in this article.

The Walpi Antelope Altar

The accompanying illustration (plate LIII) shows the Antelope altar at Walpi on the ninth day of the Snake dance. It was based on an excellent photograph made by Mr George Wharton James, who has kindly allowed me to make use of his photographic work. The plate differs from the photograph in several respects, for on the day (Totokya) on which the latter was taken several objects, as the two tiponis, were absent, and the sand mosaic was imperfectly represented. These two features are restored in the illustration.

TIPONIS

Of all objects on a Hopi altar perhaps the most important and constant is the badge of office or palladium, known as the tiponi, of the religious society which celebrates the rites about it. The Antelope altar has for the first seven days two tiponis, the Snake and Antelope. When the Snake altar is constructed the Snake tiponi is taken from the Antelope kiva to the Snake kiva, where it forms the essential object of the new altar. The two tiponis are shown in plate LIII at the middle of the side of the altar, on the border of the sand picture next to the kiva wall. The two tiponis are separated by a stone fetish of the mountain lion. These two objects of the societies, called "mothers," are the most sacred objects which the altars contain, and their presence shows that the altars are the legitimate ones. Each is deposited on a small mound of sand upon which six radiating lines of sacred meal are drawn by the chief.

STONE IMAGES OF ANIMALS

There were several stone images of animals on the Antelope altar at Walpi, which were distributed as follows on the western border of the sand mosaic near the tiponis: the largest, representing a mountain lion, stood between the two palladia of the society. It was upon this fetish that Wiki rested his conical pipe when he made the great rain-cloud smoke after the eighth song in the sixteen-songs ceremony, as elsewhere[1] fully described.

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[1] Journal of American Ethnology and Archæology, vol. IV.

ANTELOPE ALTAR AT WALPI

A HOEN & CO LITH. AUSTIN, PA.

Antelope altar at Walpi (key to plate LIII)

a, Aspergill.
at, Antelope tiponi.
b, Tobacco pouch.
c, Corn stalks.
d, Tray of prayer-meal.
e, Snake prayer-stick.
f, Basket for prayer-sticks.
g, Water gourd.
h, Butterfly-maid stone.
i, Clay pedestals.
j, Crooks (ceremonial bows).
k, Corn husk with pollen.
l, Ceremonial arrow.
m, Medicine bowl.
ng, Armlets.
o, Fetish of mountain lion.
p, King crab (*Limulus polyphemus*).
r, Rattles of Antelope priests.
st, Snake tiponi.
t, Teamahia.
nrc, North rain-cloud figure.
src, South rain-cloud figure.
wrc, West rain-cloud figure.
erc, East rain-cloud figure.
nl, North lightning-snake figure.
wl, West lightning-snake figure.
sl, South lightning-snake figure.
el, East lightning-snake figure.
ng, North gate.
eg, East gate.
sg, South gate.
hd, Bunch of feathers worn by an Antelope pries .

There were also three smaller stone animals, which belonged to Wiki, in a row by the side of the Antelope tiponi; and an equal number, the property of the Snake chief, placed in a similar way by the side of his tiponi. When the Snake chief makes his altar in the Snake kiva he takes his three animal fetishes and his tiponi from the Antelope altar and deposits them on his own altar.

TCAMAHIA

The row of flat stone implements called tcamahia was arranged around the border of the sand picture, there being on each of three sides a midway opening called a gate. There were eighteen of these objects. They were of smooth light-brown stone, similar to those often excavated from ancient Arizona ruins. Those on the northern and southern sides were regarded as male, the eastern and western ones as female tcamahia. They were looked upon as ancient weapons, representing the Warrior or Puma clan of the Snake phratry.

The displaced tcamahia on the right side of the sand picture, near a gap or gateway in the row of pedestals on that side, was the stone implement which Kakapti used in rapping on the floor as an accompaniment to one of the sixteen songs, as has been elsewhere described.[1]

It should be noted that the name of these ancient stone objects is identical with the opening words of the invocation which the asperger utters before the kisi in the public Snake dance. These words are Keresan, and are used in ceremonies of the Sia,[2] but their signification was not divulged by the Hopi priests. It is probable that we have here, as often happens in ancient customs, a designation of stone implements by the name applied to them by the people who originally used them.

STICKS ABOUT THE SAND MOSAIC

The sticks which are placed about the sand picture are of two kinds, some having a crook at the end, the others being straight throughout. The arrangement of these sticks may be seen in the accompanying plate LIII, where they are shown placed in clay pedestals on the outer margin of the sand mosaic.

The sticks provided with a crook have attached to them a string with a breast feather of an eagle, stained red. The straight sticks, called arrows, have more complicated appendages, for to their upper ends are attached a packet of meal, a feather, and a dried corn leaf. The bundles of feathers represented in the plate as fastened to the ends of these sticks are those which the priests wear on their heads during the public dances. These bundles are not found on the sticks

[1] Snake ceremonials at Walpi, Journal American Ethnology and Archæology, vol. IV, p. 34.

[2] Mrs. M. C. Stevenson, The Sia, Eleventh Annual Report of the Bureau of Ethnology. Mrs. Stevenson mentions similar words used in invocations to the warriors of the cardinal points.

PHOTOGRAPH BY MAUDE AND JAMES

KAKAPTI AT ENTRANCE TO WALPI ANTELOPE KIVA

during the first days of the ceremony; they are not essential to the efficacy of the altar, but are hung as indicated because of the sacred influence which is supposed to be imparted to them through this association. For the same reason there are placed on the altar the several rattles seen on the right-hand corner, as well as the netted water gourds which appear here only on the last two days of the Snake ceremony, in the public dances of which they are used. Two objects to the right of the tiponi, on the rear margin of the sand mosaic, have been added to the altar fetishes since the celebration of 1891. They occupied the position named during the 1893, 1895, and 1897 celebrations. One of these is the cephalothorax of a king crab (*Limulus polyphemus*), the other a fragment of water-worn wood. Both of these were gifts from the author to Wiki, the Antelope chief, in 1893.

MEDICINE BOWL AND ASPERGILL

The medicine bowl and aspergill are shown in the illustration near the front margin of the altar, to the right of the eastern "gateway" or passage through the row of crooks on that side. The aspergill consists of two feathers tied by a leather thong. By its side is a bag of tobacco. The two whizzers are flat slats of wood with rain-cloud terraces cut in the end.

OTHER OBJECTS ON THE ALTAR

On the right side of the altar, near a netted gourd, there were two corn husks, one of which contained corn meal, the other pollen for the use of the priests who sat on this side of the altar. On the same side, back of the altar, is seen the slab called the Hokona-mana or Butterfly-virgin slab, upon which are depicted butterflies, rain clouds, falling rain, and tadpoles, as has been described in a previous memoir.[1] Near the "gateway" or passage between the crooks, on the right side of the altar, is a rattle upon which two wristlets made of bark are laid. The pointed stick leaning upon a water gourd to the left of the opening through the row of crooks, in front of the alter, is a Snake paho, or prayer-stick, to one end of which are attached a dried corn leaf, a twig of sagebrush, feathers, and a corn-husk packet of sacred meal. The four markings which encircle the corn husk at its attachment to the stick are well shown in the illustration. The flat Havasupai basket to the right of the altar is the one in which the prayer-sticks are placed during the singing of the sixteen songs. The basket was empty when the photograph of the altar was made, for the prayer sticks had just been delivered to Kakapti to carry to the four world-quarter shrines.

[1] Journal of American Ethnology and Archæology, vol. iv.

Antelope Priests in the Public Dance

Twelve Antelope priests lined up near the kisi in the Walpi Snake dance of 1897 (plate LV). Eight of these stood on the same side of the cottonwood bower at the Snake rock, while four were on the opposite side. All the former were adults, and three of the latter were boys. It will at once be noticed that there is a difference in the adornment and bodily markings of the adult Antelope priests. This variation is believed to be of significance, probably being connected with the clans to which the participants belong.

Following are the names of the Antelope priests who took part in the public dance:

1. Tcoshoniwû (Tcino). This man acted as the asperger, calling out the foreign word "tcamahia" at the kisi. He wore on his head a fillet of green cottonwood leaves and a white ceremonial kilt bound about his waist with a knotted cord. His face was not painted, nor was his chin blackened; and the white marginal line from the upper lip to the ears, so typical of the Antelope priests, did not appear. He carried a medicine bowl and an aspergill, but no rattle. His body was not decorated with zigzag lines, which are so conspicuous on the chest, back, arms, and legs of the Antelope chief. Tcoshoniwû took no part in the secret rites of either the Antelope or the Snake priests, and he appeared only in the public exhibitions. He belongs to the Patki (Water-house) clan.

2. Wiki stood next in line, and as he is the Antelope chief his dress and bodily decoration were typical of the priests of that society. He wore on his head a small white feather, and his chin was painted black with a bordering white line from the ears to the upper lip. He wore a white ceremonial kilt with a knotted sash, and also moccasins and armlets. On both breasts down to the abdomen, and on his back, arms, thighs, and legs were zigzag lines in white. He carried a rattle in his right hand, a basket tray of sacred meal in his left, and on his left arm rested the Antelope palladium, or Teüb-tiponi. Wiki belongs to the Snake clan and is an uncle of Kopeli, the Snake chief.

3. Katci: The bodily decoration of this priest was like that of the Antelope chief, except that he wore a bunch of variegated feathers in his hair. He carried a stick in the left and a rattle in the right hand, and wore armlets in which cottonwood boughs were inserted. Katci is chief of the Kokop, or Firewood, clan.

4, 5. Pontima and Kwaa: The faces of these two men were painted differently from those of Wiki or Katci; their chins were not blackened, nor was a white line painted from the upper lip to the ears. Their chests were decorated with two parallel white bands, instead of zigzag lines characteristic of Antelope priests. Their forearms and legs were painted white, but not in zigzag designs. They wore embroidered anklets, but were without moccasins. Bunches of varie-

PHOTOGRAPH BY MAUDE AND JAMES

ANTELOPE PRIESTS AT WALPI

gated feathers were attached to their scalps. Each carried a paho in the left hand and a rattle in the right hand, and wore a white buckskin across the shoulders. Four hanks of yarn were tied about their left knees. Pontima belongs to the Ala (Horn); Kwaa to the Patki (Water-house).

6. Kakapti: The dress and bodily decoration of Kakapti resembled those of Katci, but he had a bowstring guard on his left wrist. Kakapti belongs to the Tüwa, or Sand, clan.

7, 8. ———: These men, as well as the three boys who stood on the left of the kisi, were dressed and painted like Kakapti. They carried similar objects in their hands.

9. Wikyatiwa: This man was clothed and painted differently from any other Antelope priest. He wore a white ceremonial kilt and sash; over his shoulder hung a buckskin and a quiver with bow and arrows. From the back of his head there was suspended a bundle of feathers tied to a bone spearpoint by a leather thong. He bore in his left hand two whizzers and at times twirled one of these with his right arm. He also carried in his left hand the so-called awata-natci, a bow with appended horsehair and feathers, which hung on the ladder during the secret rites in the Antelope kiva (plate XLIX). Upon each cheek there was a daub of white pigment, and a mark on each forearm, thigh, and leg. Wikyatiwa personated a kalektaka, or warrior, or Püükoñ, the cultus hero of the Kalektaka society or Priesthood of the Bow.

The objective symbolism of Tcoshoniwû, or Tcino, the asperger, led me to suppose that he personated the ancestral Tcamahia, the ancient people who parted from the Snake clans at Wukoki and whose descendants are said to live at Acoma.

Pontima and Kwaa, who were adorned and clothed unlike Wiki, the typical Antelope priest, show later symbolism due to contact with other than Snake clans, and suggest katcina influences. Pontima took the place of Hahawe (Ala clan), who was similarly painted in 1891 but who died in 1893.

An examination of the platoon of Antelope priests, as they lined up at Oraibi and Mishongnovi, failed to reveal any persons dressed similarly to the priests numbered 4 and 5 of the Walpi line. It appears, therefore, that we must regard this as a significant difference in the public exercises in the different Tusayan pueblos. It will also be borne in mind that in the Oraibi Snake dance the asperger, like all the other Antelopes, has white zigzag lines on his chest, and that none of the Antelope priests in the dance at Oraibi were observed to have armlets with inserted cottonwood boughs. There is, however, a close resemblance in the dress and bodily decoration of all the Antelope priests in all the pueblos except Walpi, a fact which tells in favor of the idea that the more primitive form of the ceremony is found at Oraibi and in the Middle mesa villages.

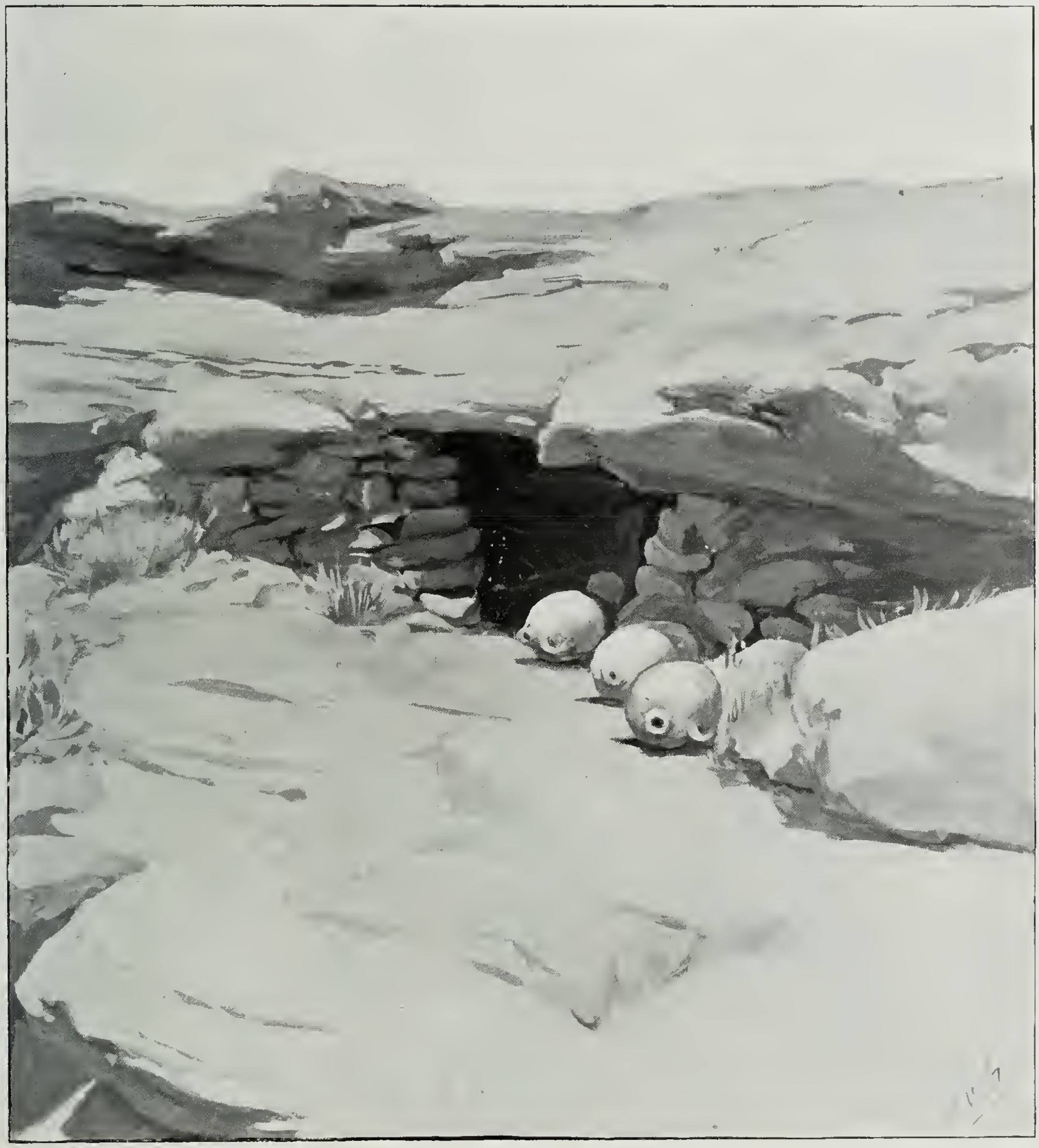
THE MOST PRIMITIVE SNAKE DANCE

We have now sufficient data regarding the five variants of the Hopi Snake dance to enable us to consider the question which one of them is most primitive or more nearly like the ancestral performance. There is no doubt which is the largest and most complex, for the Walpi performance easily holds that position; and there is no other pueblo where the influence of white men is so pronounced, especially in the paraphernalia of the participants in the public dance. To these innovations the prosperity of the East mesa people, due to their intercourse with civilization, has contributed largely. The three pueblos on the East mesa are, or have been, more frequently visited, and, as a rule, their inhabitants are more liberally disposed to improvements of all kinds than are those of Oraibi and the Middle mesa. As a result we should expect the Walpi ritual to be more greatly modified than that of any other Hopi village, and we may therefore suppose that the Snake dances of Oraibi and the Middle Mesa are nearer to the ancestral form.

It is not alone that the white man's civilization has acted more profoundly on Walpi than on more isolated Oraibi; the former pueblo is nearer Zuñi and the other New Mexican villages, and was naturally more greatly affected by outside contact before the advent of white men. The Hopi population gained many increments from the Rio Grande before the white man's influence began.

The coming of the Tanoan class of Hano exerted a liberalizing tendency on the adjacent pueblos, for their ancestors came to Tusayan with a more intimate knowledge of white people than the Hopi could have gained at that time. These Tewa received the Americans more hospitably than did the true Hopi. Men of Hano moved down from the mesa to the foothills and the plain when urged by governmental officials, braving the threats and superstitious forebodings of the more conservative people of Walpi. They have for the last twenty years exerted a liberalizing influence on Hopi relations with the United States, and that ever-growing influence has greatly reduced the conservatism of Walpi and Sichumovi.[1] Such an influence has not existed to the same extent at Oraibi and among the Middle Mesa villages. One needs but visit the three clusters of Hopi pueblos and note their present condition to see that the inhabitants of those on the East mesa are far ahead of the others in the adoption of new secular customs, and this influence can be seen in their ritual, leading to the belief that the oldest variants of ceremonies persist at Oraibi and the Middle mesa.

[1] In 1890 there were only two houses in the foothills under the East mesa and these were inhabited by Tewa families. There was not a single house at the base of the Middle mesa and Oraibi. At the present writing the foothills and plains are dotted with new houses of the white man's type.



CRYPT IN WHICH SNAKE JARS ARE KEPT AT MISHONGNOVI

FLUTE CEREMONY AT MISHONGNOVI IN 1896

The Leñya or Flute ceremony is one of the most complicated in the Hopi ritual, and one of the most important in the calendar. It occurs in five pueblos, not being celebrated at Sichumovi or at Hano. The ceremony was first described by the author in an article[1] in which the public rites or "dance" at Walpi were briefly noted and their relation to the Snake dance was first recognized. When this paper was published the author was unaware that the Flute ceremony was of nine days' duration, for in 1890, when the description was written, the existence of nine days ceremonies among the Hopi was unknown. A more extended study of the Hopi ritual in the following year (1891) revealed the fact that a Flute ceremony, similar to that at Walpi, occurred likewise in the four other Hopi pueblos which celebrate the complete ritual, and in 1892 the author described the last two days of the Flute rite at Shipaulovi. In the course of these studies it was recognized that this ceremony lasted nine days, that it was performed by two divisions of Flute priests, and that each division had an elaborate altar about which secret rites were performed.

The author was the first to recognize that several of the great Hopi ceremonies, as the Lalakoñti, Mamzrauti, Flute, and others, extend through nine days, and that the Snake ceremony has the same duration. Whether or not the other pueblo rituals have similar time limits to individual ceremonies is not clear from the fragmentary descriptions which have been published.

The increased knowledge of the intricate character of the Flute ceremony led to a detailed study of the Walpi variant, and with the aid of the late A. M. Stephen the author was enabled to publish[2] a number of new facts on the Flute ceremony at Walpi in 1892. The only account of the Oraibi variant of the Flute ceremony that has been given is a description of the altars, which appeared in 1895,[3] being a record of observations made on a limited visit to that pueblo in the summer of the year named. In the following year this account was supplemented by a memoir on the Flute altars of Mishongnovi.

It will thus be seen that there exist published accounts of the Flute altars of all the Hopi pueblos except Shumopovi, and fragmentary descriptions of the secret and public exercises in two pueblos, Walpi and Shipaulovi. The following description of the Flute exercises at Mishognovi supplement those already given and add to our knowledge of the rites of the Flute society in the largest village of the Middle mesa. It will be noticed, by a comparison of these rites, that at Mishongnovi they are more complicated than similar ceremonies

[1] Journal of American Folk-Lore, vol. IV, number 13.
[2] Op. cit., vol. VII, number 26.
[3] Op. cit., number 31.

at Walpi and Shipaulovi, but less so than those at Oraibi. No complete account of the observance of this ceremony at Oraibi and Shumopovi has been published, although it has been witnessed in the former pueblo by many Americans.

Flute Rooms

It is a significant fact that none of the secret rites of the Flute priests in any of the pueblos are, so far as is known, performed in kivas, but occur in ancestral rooms of the Flute clan. Although this is unusual in Hopi secret rites, it is not exceptional, for there are at least two other very important secret rites on the East mesa which are not performed in kivas. Since it is true, therefore, that at present a kiva is not the essential or necessarily prescribed place in which secret rites are performed, and as the ceremonies observed in living rooms are also said to be ancient, this fact may explain the absence of kivas in many Arizona ruins. Whatever the explanation, it shows that the absence of a kiva, or room set apart for secret rites, does not prove the nonexistence of an elaborate ritual.

Possibly these facts may shed light on the relative antiquity of circular and rectangular sacred rooms, or kivas, the former of which do not exist in Tusayan. Mindeleff says that "there is no doubt that the circular form is the most primitive, and was formerly used by some tribes which now have only the rectangular form." This may be true of some parts of the Pueblo area, especially in New Mexico, from San Juan river southward, where circular kivas are a marked architectural feature; but in Arizona, from Utah to the Mexican boundary, no circular kiva has been found. There is nothing to lead us to suppose that circular kivas in the former region antedated those of rectangular shape, or that New Mexican clans once had them. It seems more likely that the secret rites were once performed in ordinary rectangular rooms, or dwelling chambers, of the same shape as those now called kivas, which ultimately were given up wholly to ceremonial purposes. The Flute rooms are believed to be survivals of a time before this differentiation, which was brought about by the enlargement of the religious society by the initiation of men of other clans, through which means the fraternity outgrew the ancestral dwelling.

Ceremonial Days of the Rite

There are nine active days of the Flute ceremony, which are designated by the names given in the following list. The author has studied the proceedings of the last day, called Tihune, the day of personation.

August 7, Yuñya.
August 8, Custala.
August 9, Luctala.
August 10, Paictala.
August 11, Natuctala.
August 12, Soskahimu.
August 13, Komoktotokya.
August 14, Totokya.
August 15, Tihune.

The Mishongnovi Flute Altars

There were two Flute altars at Mishongnovi, one called the Cakwaleñya (Blue Flute), the other Macileñya (Drab Flute). The chief of the Cakwaleñya had a tiponi on his altar, but although the chief of the Drab Flute had one of these sacred palladia in the room, it was not in its customary position on the altar. The author noticing this fact, asked to see his tiponi. The chief showed it, unwinding its wrappings, but failed to explain satisfactorily why he did not set it in its proper place. The only explanation of this failure is a theoretical one, that the tiponi was not a true Drab Flute palladium. Walpi has, as is known, no Drab Flute tiponi, and as there is close resemblance between ceremonies at Walpi and Mishongnovi, it would not be strange if the same were true of the latter pueblo. Both Oraibi and Shipaulovi have this badge, which will probably likewise be found in Shumopovi. It would seem that subordinate societies may celebrate their part of a rite without a chieftain's badge, but the celebration is on that account lacking in ardor. This is the case with the Snake dance in Tusayan, which is nowhere celebrated with so much fervor as at Walpi; for in all the five villages which hold this festival there is but one Snake tiponi, that of the Snake chief at Walpi.

The reredos of the Macileñya altar (figure 43) consisted of two uprights supporting a flat wooden arch. The uprights were incised with three rows of concave depressions arranged vertically. The tranverse portion, or arch, bore four figures of rain clouds outlined by black borders, from which depended a row of parallel black lines representing falling rain. The lower third of the arch had two rows of concavities, similar to those on the uprights. The reredos stood in front of a bank of maize stacked at the end of the room, a feature common to all Flute altars, but not shown in the accompanying illustration. The parts of the altar were tied together with yucca shreds, and were held in place with wooden pegs. On the floor at the right-hand side of the altar, leaning against the wall, there were two rectangular tiles, each of which was decorated with rain-cloud symbols and dragonflies.

Two figurines were set on small heaps of sand in front of the reredos—one on the right, called the Flute youth; the other on the left, the Flute maid. These figurines were armless effigies, with prominent lateral appendages to the head in the place of ears. Each of these appendages was tipped with radiating rods connected by red yarn, and resembled a symbolic squash blossom. The cheeks bore triangular markings. Six feathers, three on each side, projected at right angles from the sides of the body, and a narrow painted band, consisting of alternate blocks of black and white, was made along the medial line, extending from a symbolic figure of a rain cloud upon which half an ear of maize was painted. These two figurines are similar in position and shape to the effigies on other Flute altars, as elsewhere described,

and have the same names. Just in front of the figurines, one on each side, were placed short, thick, upright sticks, rounded at the top and pierced with holes, from which, like pins from a cushion, projected small rods tipped with flaring ends painted in several colors, representing flowers. These sticks correspond to the mounds of sand, covered with meal, of other Flute altars, and are called talastcomos. The mounds admit of the following explanation: In many stories of the origin of societies of priests which took place in the underworld, the first members are represented as erecting their altars before the "flower mound" of Müiyiñwû. This was the case of the Flute youth and

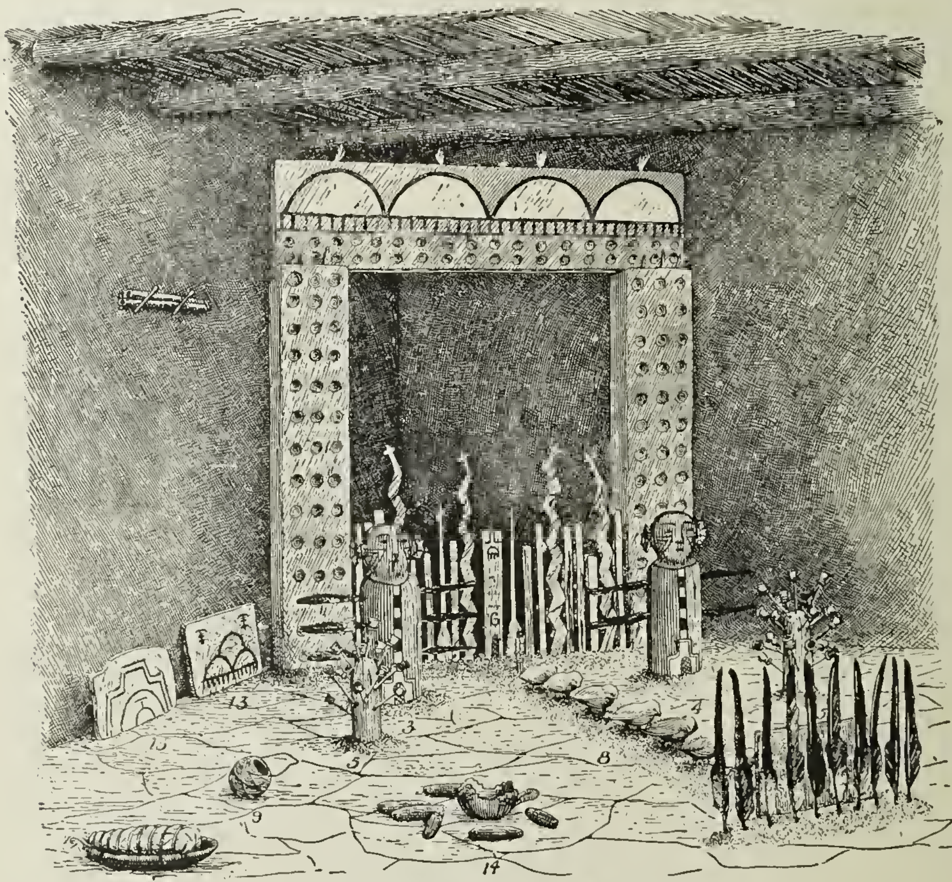


FIG. 43—Altar of the Macileñya at Mishongnovi.

Flute maid, progenitors of the Flute Society. These mounds, now erected on earth before the figurine of Müiyiñwü in the Flute chambers, symbolize the ancestral mounds of the underworld, the wooden objects inserted in them representing flowers.

The interval between the uprights of the reredos was occupied by a number of zigzag sticks or rods (symbolic of lightning), cornstalks, and other objects.

These rods and sticks, as well as the uprights themselves, were held vertically by a ridge of sand on the floor. From the middle of this ridge, half way from each end and at right angles to the altar, there

was spread on the floor a zone of sand upon which meal had been sprinkled. This zone terminated at the end opposite the reredos with a short bank of sand at right angles to it, in which an upright row of eagle-wing feathers was set. Upon the zone of sand there was placed a row of rudely carved bird effigies, and at the extremity of this row, just before the eagle-wing feathers, stood a slab upon which was depicted half an ear of maize and two rain-cloud symbols, one of the latter being on each side. Between the first bird effigy and the slab was a medicine bowl, from which the nearest bird appeared to be

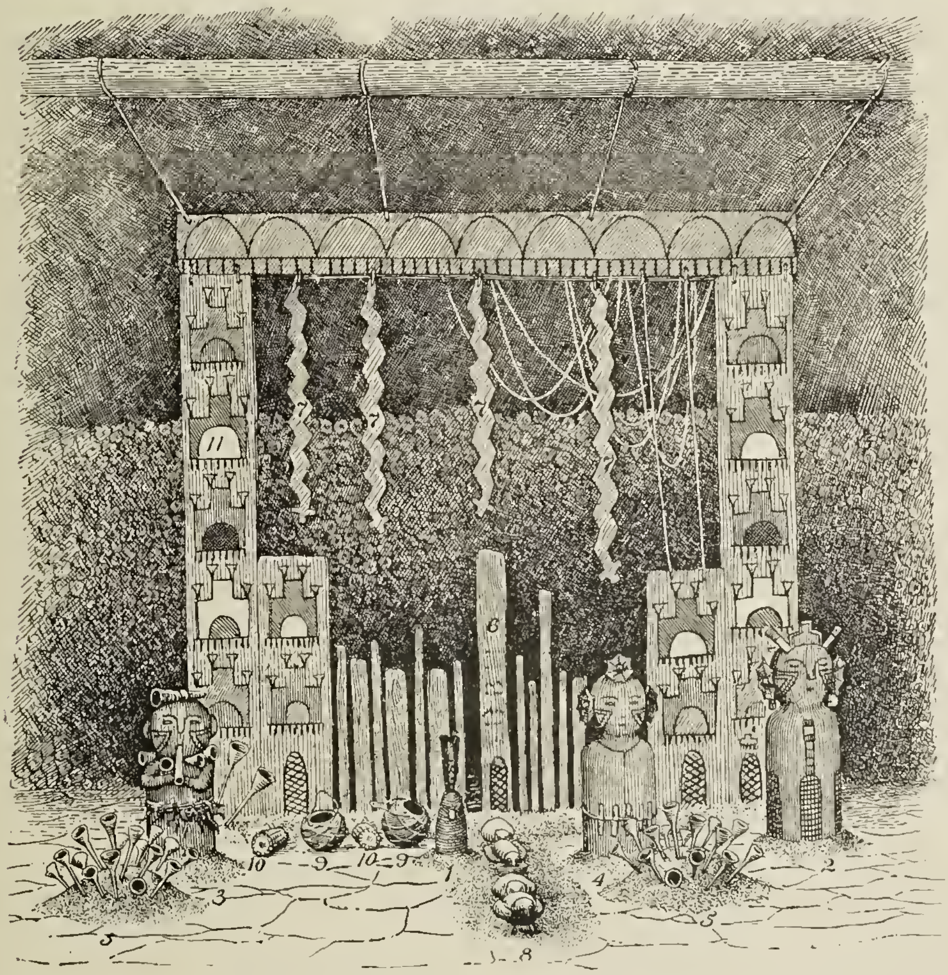


FIG. 44—Altar of the Cakwaleñya at Mishongnovi.

drinking. The bird effigies were eight in number, all facing from the altar. There were likewise on the floor other ceremonial paraphernalia common to all altars, among which may be mentioned the six-directions maize (corn of six colors used in a six-directions altar), rattles, a medicine bowl, a basket-tray of sacred meal, a honey pot, and similar objects. Their position on the floor by the altar is not significant.

The altar of the Cakwaleñya society (figure 44) was even more complicated. Its reredos consisted of uprights and transverse slats of

wood, the former decorated with ten rain-cloud pictures, five on each side, one above the other. These symbols had square outlines, each angle decorated with a figure of a feather, and depending from each rain-cloud figure, parallel lines, representing falling rain, were painted. The transverse slat bore a row of nine rain-cloud figures of semicircular form. Four zigzag sticks, representing lightning, hung from the transverse slat between the vertical or lateral parts of the reredos. Two supplementary uprights were fastened to the main reredos, one on each side. These were decorated at their bases with symbolic pictures representing maize, surmounted by rain-cloud figures. The ridge of sand between the uprights of the altar supported many smaller rods and slats, the one in the middle being decorated with a picture of an ear of corn.

From the middle point of this ridge of sand a wide trail of sand, covered with meal, was drawn across the floor at right angles to the altar. This zone terminated abruptly, and upon it was placed a row of four bird effigies, all facing from the altar. Between the second and third bird was a small bowl. A tiponi stood at the left of the sand zone, looking toward the altar, and at the left of this were two water gourds alternating with ears of corn.

Three figurines stood before the altar, one on the left, and two on the right side. The figurine on the left represented the Flute youth, who held in both hands a miniature flute upon which he appeared to be playing. On his head was a corn-husk packet, and around his neck a necklace of artificial flowers. Of the two figurines on the other side, one represented the flute maid, the other Müiyiñwû. The latter had an ear of maize depicted on each of the four sides of the body. Upon her head were three rain-cloud symbols, and her cheeks were decorated with triangular markings. On the floor in front of the two smaller figurines were hillocks of sand, into which were inserted small rods with trumpet-like extremities variously colored.

Although the author did not witness the secret ceremonials of either of the Flute societies at Mishongnovi, for want of time, he saw from the nature of the prayer-sticks (pahos) that they probably resembled the rites at Shipaulovi. In addition to the prescribed Flute pahos he observed the manufacture of the two wooden slabs, decorated with corn figures, which were carried by the maidens in the public dance, and the balls of clay with small sticks, called the tadpoles, which are made in both the Flute and the Snake ceremonies at Walpi. There is close resemblance between the small natcis, or Flute pahos, tied to the ladder of each of the Flute houses, and the awata-natcis, or standards, with skins and red-stained horsehair, that are placed on the roofs of the chambers in which the altars are erected.

CAKWALEÑYA SOCIETY OF MISHONGNOVI

COMPARISON WITH THE WALPI FLUTE ALTAR

As has been already pointed out, there is but one Flute altar at Walpi, that of the Cakwaleñya, the Macileñya society having become extinct. The uprights of the reredos in the flute altars of both pueblos bear similar symbolic pictures of rain clouds, five in number, one above the other. The transverse slat, or the arch, of the Walpi Flute altar differs from that of the Mishongnovi in having a picture of Tawa (sun), with two semicircular rain-cloud figures on each side, in the interval between which is pictured a zigzag figure representing lightning. Both altars have images of the Flute youth, Flute maid, and Müiyiñwû, and so far as is known they are the only Tusayan Flute altars which have an effigy of the personage last mentioned. The Walpi figurine of the Flute youth has no flute in his hand, and the slabs with figures of persons playing the flute, elsewhere described, which characterize the Walpi altar, are not found at Mishongnovi.

COMPARISON WITH THE ORAIBI FLUTE ALTARS[1]

The uprights of the reredos of the Drab Flute altar at Oraibi have the same rows of concavities on their front surfaces as have those at Mishongnovi, and are without the rain-cloud symbols seen on the transverse slat; but instead of having a row of concave depressions on its lower half, the transverse part of the Oraibi reredos is in the form of a rain-cloud, ornamented with differently colored cloud symbols, one above another, with accompanying representations of lightning and figures of birds. No other Flute altar known to the author has a more elaborate reredos than that of the Macileñya at Oraibi. In common with the Drab Flute altar at Mishongnovi it has two effigies of the cultus heroes of the society, the Flute youth and the Flute maid; but the most remarkable statuette of the Oraibi altar was that of Cotokinuñwû, which stood with outstretched arms in a conspicuous position. No other known Flute altar has a figurine of this personage, although it is possibly represented by the zigzag lightning-sticks hanging between the uprights of the reredos.

The so-called flower mounds, or hillocks of sand beset with artificial flowers, before the figures of the cultus heroes of the Oraibi altar differ in form from those at Mishongnovi, although they evidently have the same significance. At Oraibi these flowers are fastened to a common stalk, while at Mishongnovi their stems are inserted in a log of wood, and at Shipaulovi in a mound of sand.

Perhaps the most marked difference between the Drab Flute altar of Oraibi and that of Mishongnovi is the presence on the floor of the former of a mosaic made of kernels of maize of different colors representing a rain-cloud; in this feature it differs from all other

[1] The Mishongnovi Drab Flute altar has certain likenesses to the Oraibi Flute altar elsewhere described. Journal of American Folk-Lore, vol. VIII, number 31.

altars known to the author. This mosaic occupies the position of the zone of sand, and as a consequence the row of birds placed on this zone are, in Oraibi, found in two clusters, one on each side of the maize mosaic. There are several objects on the Oraibi Flute altar which are absent from that at Mishongnovi, among which may be noticed a bowl back of the tiponi, wooden objects, artificial flowers like those inserted into the mounds of sand, and panpipe-like objects. The two upright wooden cylindricals representing maize, the raincloud symbols between the uprights of the altar, and the statuette of Cotokinuñwû appear to be characteristic of the Oraibi altar.

Markedly different as are the Drab Flute altars of Oraibi and Mishongnovi, those of the Blue Flute are even more divergent. In fact, they have little in common, and can not readily be compared. The Oraibi altar has no reredos, but paintings on the wall of the chamber serve the same purpose. The Oraibi altar is composed of a medicine-bowl, placed on the floor and surrounded by six differently-colored ears of maize laid in radiating positions (a six-directions altar), the whole inclosed by a rectangle composed of four banks of sand into which rows of eagle wing-feathers had been inserted.

The reason the Oraibi Cakwaleñya altar is so poor in fetishes would have been found to be paralleled in the Walpi Macileñya altar, now extinct, were we acquainted with its character. We shall never know what the nature of this altar was, notwithstanding the fact that it fell into disuse within the memory of a chief who died only a few years ago; but the author believes that one reason for its disappearance was that the Macileñya division of the Flute fraternity had no chieftain's badge, or tiponi.[1]

No object corresponding with the bundle of aspergills tied to a rod and set upright in a pedestal, described in my account of the Oraibi Flute altar, was seen in either of the two Flute chambers at Mishongnovi, nor do I recall its homologue in Walpi or Shipaulovi. As the standard, or awata-natci,[2] stood in the Flute chamber, and not on the roof, when I saw the altar, it is possible that the aspergills belong with this object rather than to the altar itself.

COMPARISON WITH THE SHIPAULOVI FLUTE ALTARS

Both Flute altars at Shipaulovi are simpler than those at Mishongnovi, a feature due in part to the fact that Shipaulovi is a smaller pueblo and is of more modern origin.

The reredos of the Blue Flute altar[3] is composed of a few upright

[1] This sacred palladium ("mother") is, as has been repeatedly pointed out, the essential object of the altar, the great fetish of the society. A religious society destitute of it is weak, and rapidly deteriorates. Hence the want of virility of the Snake society at Oraibi and the pueblos of the Middle mesa. Their chiefs have no tiponi and the cult is not vigorous.

[2] The staff is set on the roof to indicate that the altar is erected, and the secret rites in progress in the chamber below. The term awata-natci, "bow upright," is descriptive of the standard of the Snake and Antelope ceremonials, when a bow and arrows are tied to the kiva ladders (plate XLVII).

[3] See The Oraibi Flute Altar, Journal American Ethnology and Archaeology, vol. II.

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slats of wood without a transverse portion. Figurines of the Flute youth and the Flute maid are present, but there is no statuette of Müiyiñwû as at Mishongnovi and Walpi. There are two tiponis and two talastcomos. The sand zone and row of birds are present, and a very characteristic row of rods stands vertically in front of the reredos, where the sticks of zigzag and other forms are found in known Flute altars. In the absence of an upper crosspiece to the reredos the four sticks representing lightning hang from the roof of the room.

The great modifications in the Shipaulovi[1] altar lead the writer to suspect that the altar is more nearly like that of Shumopovi than any other, but until something is known of the altars of the latter pueblo this suggestion may be regarded as tentative.

The altar Macileñya (Drab Flute) at Shipaulovi differs in many respects from that at Mishongnovi, but is in a way comparable with that at Oraibi. The reredos consists of several sticks, some cut into zigzag forms, symbolic of lightning, but there is no transverse slat, as at Mishongnovi and Oraibi. A flat stick upon which is painted a zigzag figure of a lightning snake, elsewhere figured,[2] is interesting in comparison with figures on the Antelope altar at Shumopovi. The four lightning symbols drawn in sand in the mosaic of this altar have horns on their heads, and depending from the angles of the zigzags of the body are triangular appendages, representing turkey feathers, similar to those which are depicted on the Flute slab to which reference is made above. Although the Antelope altar in the Shipaulovi Snake ceremony has no such appendages to the lightning symbols, it is interesting to find these characteristic appendages in symbolic figures used in related ceremonies, where their presence is one more evidence of close relationship between the two pueblos and of the late derivation of the ceremonials of Shipaulovi from Shumopovi.

The position of the image of Cotokinuñwû in the Oraibi Flute altar was occupied, in the Shipaulovi Macileñya altar, by a statuette of Taiowa. Studies of this figurine were not close enough to allow the author to decide whether Taiowa, as represented on the Shipaulovi altar, is the same as Cotokinuñwû, but it is highly probable that the two bear intimate relationship. This figurine is absent from the Oraibi altar, but the pathway or zone of sand, with the birds, the row of feathers, and the decorated slab before it on the Shipaulovi altar are comparable with like parts of a similar altar at Mishongnovi.

There remain undescribed the Flute altars of Shumopovi, the ritual

[1] Shipaulovi, "High Peach Place," was founded after the advent of the Spaniards, probably later than 1700. Unlike Mishongnovi and Shumopovi, there is no ruin at the foot of the mesa which is claimed as the former home of the ancestors of this pueblo. Tcukubi, the nearest ruin, appears to have been deserted before the sixteenth century, and the adjacent Payüpki was a Tewa pueblo whose inhabitants left it in a body in the middle of the eighteenth century, and are said to have settled at Sandia, on the Rio Grande.

[2] Journal American Ethnology and Archæology, vol. II, p. 120.

of which pueblo is little known. These altars are erected in August of every odd year, and figures or descriptions of them would complete our knowledge of Hopi Flute altars.

Public Flute Ceremony

The public dance of the Flute priests at Mishongnovi in 1896 occurred on August 15th, at about 5 p. m., and closely resembled that of Shipaulovi and Walpi. The preliminary exercises of that day at Toreva spring, which took place just before the march to the pueblo, were not witnessed, but the procession was followed from the time it reached the first terrace of the mesa below the pueblo until it entered the plaza. As a detailed account of the ceremonies at Toreva spring has been given in a description of the Shipaulovi Flute dance, it will not be necessary to repeat it here.

After the preliminary exercises at the spring a procession was formed which marched to the mesa top along the trail into the pueblo. This procession was aligned in two platoons about thirty feet apart, one called the Cakwaleñya, the other the Macileñya. The personnel of these platoons was as follows:

PERSONNEL OF CAKWALEÑYA SOCIETY.

The Cakwaleñya society formed the first platoon and was composed of the following personages:

1. The chief.
2. A Flute boy.
3. Two Flute girls.
4. A man wearing a moisture tablet on his back.
5. Four men with white blankets.

The members of this division were arranged as follows: In advance of the procession walked the chief, and directly behind him was the Flute boy with a Flute girl on each side. The remaining members of the division formed the body of the platoon, flanked by the man with the moisture tablet on his back and a small boy with the Flute standard at his left (plate LVII).

PERSONNEL OF MACILEÑYA SOCIETY.

The Macileñya priests formed the second platoon, which consisted of the following persons:

1. The chief.
2. Flute boy.
3. Two Flute girls.
4. A man with the sun emblem on his back.
5. Men with cornstalks.
6. Five men with white blankets.
7. A naked boy with Flute standard.
8. A warrior.

MACILEÑYA SOCIETY OF MISHONGNOVI

The arrangement of this division was similar to that of the Cakwaleñya, but it will be noticed that the number of participants was larger. The five men with white blankets walked side by side, while the others, bearing cornstalks, and the man with the sun emblem, formed the left wing of the platoon. A naked boy with the Flute standard accompanied the Maciléñya group (plates LVIII, LIX).

THE FLUTE CHIEFS

Each of the Flute chiefs carried his tiponi resting on his left arm, and had a basket-tray of meal in his left hand. He wore a white ceremonial garment, or kilt, with a knotted sash. The chief of the Cakwaleñya is not shown in the accompanying illustration (plate LVII), but the man next to the priest with the sun emblem is the Maciléñya chief.

THE FLUTE GIRLS

There were four Flute girls, one on each side of the two Flute boys. They were all clothed alike and bore similar objects in their hands. Each wore a downy feather on the crown of her head, and her hair was tied with a string at the back of the neck. In her ears were square mosaic turquoise pendants, and several necklaces were also worn. The chin was painted black; a white line was drawn across the cheeks from ear to ear along the upper lip. Each girl wore two white blankets, one as a skirt fastened by a girdle having long white pendants knotted at the point of attachment. In her left hand she carried objects similar to those borne by the boy, and in the right a small annulet with a loop made of yucca fiber, by which it was slipped over the end of a stick (plate LXI). The dress and facial decoration of the Flute girls were identical with those of the Snake maid in the kiva during the dramatization about the Antelope altar at Walpi, and the two are supposed to be the same as the maids which are also represented by effigies on the Flute altars.

THE FLUTE BOYS

The Flute boys of the two Flute divisions were dressed alike, and were furnished with the same offerings. Each wore a feather in his hair and a white ceremonial kilt over his loins. The arms, body, and legs were naked, and each carried in his left hand a netted gourd with water from Toreva spring, and a wooden slat upon which was depicted an ear of corn to which a feather was tied. In his right hand he bore a small, black, painted stick about an inch long, with a yucca fiber loop, by which it was carried, slipped on the end of a stick not unlike those about the Antelope altars. His hair hung loosely down his back.

In all essential features the Flute boys were clothed and decorated in the same manner as the Snake youth in the kiva exercises of the

Walpi Antelope priests on the morning of the ninth day of the Snake ceremonies, with the exception that the boy personating the Snake youth carried a rattlesnake in one hand. These Flute boys represent the ancestral or cultus hero of the Flute society, and bear the same relationship to the priests that the Snake youth (Tcüa tiyo) bears to the Antelope-Snake fraternities.

STANDARD BEARERS

The small naked boys at the ends of the platoons carry the Flute standards, which consist of long sticks to the ends of which skins of mammals and feathers are tied, also a string to which red-stained horsehair is attached. The Flute standard corresponds to the Snake standard (awata natci), consisting of bows and arrows with appended objects, the most conspicuous of which is the string of red horsehair borne by Wikyatiwa in the Snake dance. This standard is set upright on the roof of the room in which the Flute ceremonies are held, just as the awata natcis are tied to the ladders of the Antelope and Snake kivas, as shown in plates XLVII and LIV.

BEARER OF THE MOISTURE TABLET

One of the most conspicuous members of the first platoon was the man who bore on his back a rectangular framework over which was stretched a buckskin or cloth on which were painted, in bright colors, a number of parallel lines dividing it into rectangular fields, with borders of colored bands (plate LVIII). On the upper edge of the tablet, which covered the entire back of its bearer, was a bunch of feathers, and along each of the other three sides was stretched a cord, from which was suspended horsehair stained red. On the sides of the tablet were tied small round disks made of sections of gourd painted in colors, possibly representing cornflowers. A further description of one of these tablets, with an illustration, has been given elsewhere.[1]

BEARER OF THE SUN EMBLEM

As previously stated, one of the Macileñya bore on his back a disk representing the sun. It was made of buckskin stretched over a hoop which was strengthened by a framework of two sticks fastened at right angles. This disk, which was about a foot in diameter, was surrounded by a plaited border made of corn husks, into which eagle feathers and red-stained horsehair were inserted. The sun shield was attached to the back of the bearer by a cord over his shoulders. The body of the bearer was naked, save for a white ceremonial kilt with a pendent foxskin, and he had a tuft of feathers on the crown of his head. He carried a flute upon which he played, and wore moccasins

[1] American Anthropologist, vol. V, number 3, pl. II.

PLATOONS OF FLUTE PRIESTS MARCHING FROM THE SPRING TO MISHONGNOVI

and anklets (see plate LX). The natural inference is that the man wearing the sun emblem in such a conspicuous way personated the sun.[1] It will be observed that one of the figurines on the Flute altar (figure 44) is represented with a flute to its mouth. The whole ceremony commemorates the advent of the Corn maids, called by the tutelary name of the society, the Flute maids, and just as the Sun is said to have drawn them to himself in ancient times, so now the descendants strive by the same method to tole the personators of the same maids into the pueblo.

THE WARRIOR

A man clothed as a warrior, wearing a buckskin on his back and carrying a quiver of arrows over his shoulder, followed the procession. He carried a bow in one hand and in the other a whizzer or bullroarer, which he twirled at intervals. The bundle which he bore is the clothing of certain of his fellow-priests which they have doffed and given him to carry to the mesa top.

Most of the Flute priests had corn plants in their belts, and a few of them carried cornstalks in their hands. This accords with one of the main objects of the Flute ceremony—the growth of corn, the Hopi national food.

MARCH FROM TOREVA TO THE PUEBLO

After the two platoons had formed on the edge of Toreva the chief of the Cakwaleñya sprinkled a line of sacred meal, across which he made three rain-cloud symbols and three parallel lines representing falling rain. The Blue Flute boy and girls who stood at his side on the line facing the mesa (plate LXIII) threw their offerings toward this figure—the former, the small stick of wood; the latter, the annulet made of twisted flag leaves. The chief picked up these objects and set them on the rain-cloud signs which he had drawn, and the three children, followed by the platoon of priests, advanced to the symbols, the men singing, accompanied by the flutists. The children bent over, and, inserting the ends of their sticks into the loops, raised the offerings and held them extended, as the whole platoon marched forward to another set of rain-cloud meal-symbols which the chief had made some distance from the first. The platoon of Macileñya followed, conducting the same performance as the Cakwaleñya. Thus along the trail from Toreva to the plaza the two platoons halted at intervals, repeating what has been described several times without variation, before they came to the pueblo. They halted three times and performed the same acts as they crossed the plaza until they stood before the

[1] The symbolism of the sun disk is illustrated in a memoir on Tusayan Katcinas in the Fifteenth Annual Report of the Bureau of Ethnology. The emblem borne on the back of the Flute man, above mentioned, is identical with that described in the article cited, save that the latter is surrounded by radiating eagle feathers.

kisi, in front of which they sang for some time. After the first platoon had sung their songs before the kisi, they handed the offerings borne by the boy and the girls to a man within it,[1] and retired to the chamber where their altar stood. The second platoon followed, doing the same, after which they likewise retired and the ceremony closed with purification and the dismantling of the altar.

During the march to the pueblo, and later, before the kisi, the priests sang Flute songs, accompanied by the flutists. These songs are among the most melodious in Hopi ceremonies, and are worthy of special study. The songs at the kisi were especially pleasing, and as each division stood before the cottonwood bower and sang, it made a fine exhibit of aboriginal worship.

FLUTE CEREMONY AT WALPI IN 1896

The exercises of the Flute priests at Walpi in 1896 began on August 12 and continued until August 21, when they closed with the public dance. The author was able to witness the rites celebrated on the 12th, 13th, and 14th of the month, finding in them considerable variation from those performed on the same relative days of 1892.[1] The significance of these variations is not known, but as material for an ultimate explanation it has been deemed advisable to record them.

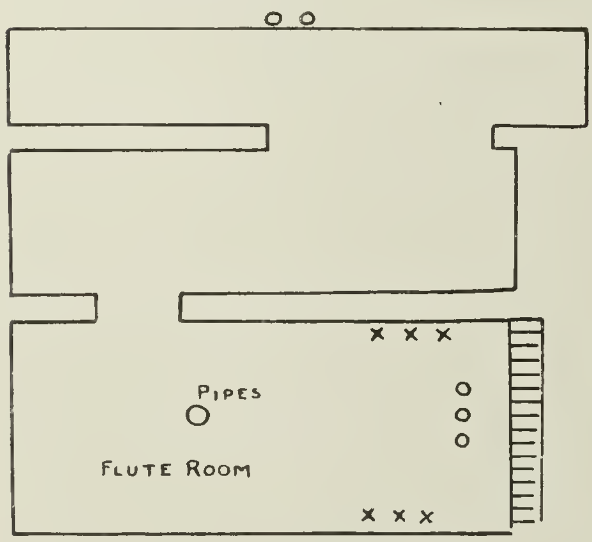

Fig. 45—Plan of Flute room at Walpi.

The secret observances of the Walpi Flute ceremony occur in a large house on the north side of the pueblo, about opposite the passageway opening northward from the plaza in which the Snake dance is celebrated. This house (figure 45), the ancestral Flute chamber, has an open balcony in front and exemplifies an ancient form of architecture which has well-nigh been abandoned on the East mesa. It was the first home of the Flute clan after it moved to the mesa summit, the ancient home of the Snake clan being just above the so-called Snake rock, which rises from the south end of the main plaza. The two houses

[1] The Flute chief crawled into the kisi, and certain objects, as pahos, water gourds, and meal were passed in to him, but what occurred within was concealed from view. The small netted gourds of water which the boy and girls carried (plate LXIII) are the same as those used in the Snake dances.

[1] For an account of the Walpi Flute ceremony of 1892 see Journal of American Folk-Lore, vol. VII, number 26.

LEÑYA (FLUTE) CHILDREN OF MISHONGNOVI

mentioned are separated by a court, and probably never adjoined. Other phratries, as the Patki and Honani, were formerly domiciled in houses separated from both the Snake and Flute dwellings, so that, originally, probably Walpi consisted of a number of small clusters of houses which, through later building, were in part consolidated into a compact pueblo.

There were present in the Flute chamber at about 10 oclock on the assembly day (August 12) the following priests: Tu^{r}noa, Flute chief; Hoñyi, speaker chief; Sikyabotima, courier, and another man. Later there came in Winuta, Hani, and one or two others who had been there earlier in the day. This was known from the fact that they did not make the customary offering of meal on their entrance. It is prescribed for a priest on entering a kiva for the first time to sprinkle with sacred meal any altar or fetishes which may be in place. An interesting altar had been erected in the Flute room, and as this altar is characteristic, a description of it will be desirable.

First Flute-Altar

There were two Flute altars at Walpi, but neither of these pertained to the Drab Flute society, for this society is extinct at that pueblo. On the first day the Walpi Flute society erected their altar on a ridge of sand just in front of the stack of corn which filled one end of the Flute chamber. The altar (plate LXIV) is called the first Flute altar[1] to distinguish it from the second or main altar. As the songs of the first three days were sung by priests before this altar, it appears to be an important accessory in the Flute worship.

A low ridge of valley sand was made before the stacked corn at one end of the Flute chamber, and in this ridge, at regular intervals, were placed three tiponis, those of Tu^{r}noa, Winuta, and Hoñyi, respectively, beginning at the left. From Hoñyi's tiponi a line of meal extended across the floor toward the doorway, and over this line was stretched a string, to the extremity of which were fastened two feathers. The length of this string was measured from the finger tips of the outstretched arm to a point above the heart, and it was drawn through a handful of sacred meal before being laid in position. When each tiponi was ready to be set in place, the chief to whom it belonged first made six radiating lines on the sand ridge where it was to stand, and deposited half a handful of meal at their junction. On this the tiponi was placed.

On the floor in front of Tu^{r}noa's tiponi, there was a basket-tray containing sacred meal; a similar tray containing stringed feathers made

[1] Whether the other pueblos have a similar altar on the first day is unknown, since no one has fully studied the opening of the Flute ceremony in any other village. But probably it will be found that the societies in the other villages have an altar corresponding to this first Flute altar of Walpi

by members of the society stood before Winuta's lodge, and the medicine bowl was on the floor near Hoñyi's tiponi.

Two bullroarers or whizzers lay on the floor by the medicine bowl and paho basket, and when returned to their position after being used, were always so placed that the strings were at the end toward the altar. All the priests accompanied their songs on small gourd rattles, but Tu^{r}noa had a "moisture rattle," or paaya, which has already been figured and described.[1]

This altar is almost identical with that which is erected in the winter flute ceremony, and the same persons took part in almost identical rites about it.

The Second Flute Altar

The second or elaborate flute altar was erected on the fourth day. This the author was unable to see, being obliged to go to the Middle mesa on the morning of that day to witness parts of the Mishongnovi Flute ceremony.[2] All the parts of the altar were, however, examined as they lay on the floor, and drawings were made of several of them early in the morning of the day named.

The symbolism on the reredos of the Walpi flute altar was exceptional. The designs on the uprights were typical of flute altars, representing rain clouds and falling rain. An exceptional figure was a representation of the sun in the middle of the transverse part of the reredos. This figure does not occur in any of the other flute altars which have thus far been studied.

Elsewhere there have been figured the four slabs which stand about the upright stick on the roof of the Flute house at Shipaulovi on the final days of the ceremony.[3] As similar slabs, used for the same purpose at Walpi, have never been figured, for purposes of comparative study they are represented in the accompanying illustration (plate LXV). They are placed on the roof at the north, west, south, and east sides of the upright rod, or awati-natci, as is indicated by their respective colors—yellow, green, red, and white. During the morning of the fourth day they were all repainted.

Flute Songs

The exercises about the first flute altar began by a ceremonial smoke, during which Sikyabotima acted as pipe lighter, passing the pipe first to Tu^{r}noa with the greeting "Inaa" ("My father"),[4] to which the Flute

[1] The Walpi Flute Observance, op. cit.

[2] It is next to impossible for one person to study thoroughly any great Tusayan ceremony during a single performance. Important rites are often being performed simultaneously in several rooms, while at the same time significant observances may take place in the plaza of the pueblo.

[3] Journal of American Ethnology and Archeology, vol. II.

[4] These two men are of about the same age, or, if there is any difference, the Flute chief is younger than Sikyabotima. The designation "My father" refers to society precedence, not to the family relationship. I have heard a young man of twenty ceremonially called "grandfather" by an old man of sixty or more. The terms "father," "son," "elder brother," "younger brother," etc., used in passing the pipe, are ceremonial, not family relationship terms.

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chief responded with "Itii" ("My son"). He then lighted a second pipe and handed it to Hoñyi with the word "Itupko" ("My elder brother"). to which the response "Iviva" ("My younger brother") was given. After Hoñyi had smoked he returned his pipe to Sikyabotima, and the Flute chief did the same. Tu^{r}noa. Hoñyi, Winuta, and Sikyaustiwa then prayed in sequence.

At the close of the prayers the songs began, the priests all keeping time by beating or shaking their rattles, and the Flute chief holding the paaya, or "moisture rattle," previously referred to. During the songs an old man cast pinches of meal to the cardinal points in sinistral sequence, and Winuta asperged medicine water toward the same directions by means of a feather.

When the songs were about half finished Sikyabotima took the whizzers or bullroarers from the floor before the altar and twirled them several times, after which he went into an adjoining room and repeated the same action. Hani accompanied the songs with a flute.[1] When the singing came to an end, prayers followed, and a ceremonial smoke closed the exercises.

Four chiefs were in the room on the opening day, and each of these made four nakwa kwoci or stringed feathers. No prayer-sticks were made on this day, nor on the next two days, a feature at variance with what occurred in the 1892 ceremony. The sixteen nakwakwoci were arrănged in a basket-tray in four clusters indicating four cardinal directions, and were placed before the tiponis as shown in the illustration (plate LXIV). These were later offered to the gods of the four world-quarters. Pahos were said to have been made on the day on which the main altar was erected.

Unwrapping the Flute Tiponi

The unwrapping of the flute tiponi took place on the second day at about 1.30 p. m., the time consumed being somewhat over an hour.

On entering the room the author found a number of Flute priests assembled, Winuta squatting on a white buckskin which had been spread over a white woolen blanket, beneath which was a red Navaho blanket of ordinary pattern. He wore a ceremonial kilt and had a feather tied to his scalp lock; otherwise he was naked. On the buckskin before him were spread, in regular rows, feathers and strings, with other appendages of the tiponi, the core of which he held in his hand. This core consisted of a wooden cup-shape object, in the cavity of which was inserted an ear of white corn with four black painted

[1] The so-called flute used in the flute ceremony is different from the instrument usually known by that name, in that the person using it does not blow across a hole in the side, but across a terminal opening, although producing the tone by the same mechanical principle. To the extremity of the instrument is attached a trumpet-like piece of gourd, which is sometimes painted in many colors. The operator fingers certain holes along the side of the flute while playing.

marks extending longitudinally (figure 46). The four quadrants of the cup were decorated on the exterior with symbols of corn and rain clouds, and on the base were two black lines crossing at right angles. There lay on the buckskin, at one side, another ear of corn, a quantity of cotton string, and many feathers which had been taken from the tiponi and rejected, for a new ear of corn was to replace the old, and new wrapping was to be added. The grains of corn from the old tiponi were later planted, and many of the feathers were placed in shrines.

In wrapping the tiponi the priest held the core in the left hand, and wound[1] the cotton string about it, inserting at times the feathers which protruded beyond the ear of corn. Suggestions were made in the course of the wrapping by several of those present, and many of the old feathers were replaced in the new bundle.

After the tiponi had been wrapped, and a string with attached shells added as a necklace, Winuta and Tuʳnoa, the young Flute chief, arose and stood on the blanket side by side, facing the east, Tuʳnoa being on the left. Both were naked save for a breechcloth, and Winuta held the tiponi in his right palm, grasping it midway of its length with his right hand. Winuta addressed a few words to Tuʳnoa, who responded "Antcai" ("It is well"). Hoñyi then took Winuta's place and spoke in the same strain to the Flute chief, who remained standing. The tiponi, which had been passed by Winuta to Hoñyi, was transferred by the latter to Sikyaustiwa, who followed the actions of the others by handing it to Hani, who made a fervent appeal and passed it to Tuʳnoa. After the Flute chief Tuʳnoa had received the palladium he carried it to the altar, and made with sacred meal, on the mound of sand where it formerly stood, six radiating lines, placing the tiponi at their junction. He then returned to that part of the room where the blankets had been spread on the floor, and smoked in silence for a long time.

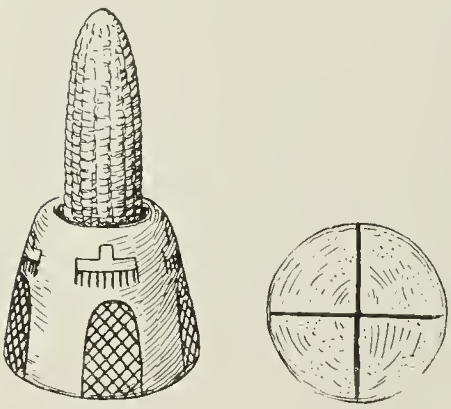


Fig. 46.—Core of Flute tiponi.

In a previous and fuller account of the renewal of the tiponi, in 1892, it was said to take place on the sixth day after the main altar had been erected. It is possible that this and other variations may in part be due to the death of the old Flute chief Cimo and the elevation of his younger successor Tuʳnoa.

[1] As he wound the tiponi he allowed the string to be drawn through his hand, which contained sacred meal. The winding was always toward the left, or in the direction called the sinistral ceremonial circuit.

FLUTE CHILDREN OF MISHONGNOVI THROWING OFFERINGS ON RAIN-CLOUD SYMBOLS

The unwrapping of the tiponi has been witnessed in two Hopi ceremonies, the Flute and the Lalakonti. In these instances the contents of the palladium varied, but in both either kernels of corn or other seeds form essential parts. From chiefs of other societies it has been learned that their tiponis likewise contained corn either in grains or on the ear. Although from this information one is not justified in concluding that all tiponis contain corn, it is probably true with one or two exceptions. The tiponi is called the "mother," and an ear of corn given to a novice has the same name. There is nothing more precious to an agricultural people than seed, and we may well imagine that during the early Hopi migrations the danger of losing it may have led to every precaution for its safety. Thus it may have happened that it was wrapped in the tiponi and given to the chief to guard with all care as a most precious heritage. In this manner it became a mere symbol, and as such it persists to-day.

The Kisi

In no public ceremony of the Hopi is the cottonwood kisi introduced except in the Snake and Flute rites, in both of which its construction is identical. This brush-house is doubtless a survival from very ancient times, and is related with the history of the ceremony with which it is connected. A line of meal is sometimes drawn around it. It is stated by the Snake people that they were the original inhabitants of Walpi, and there is no doubt that the Bear, Snake, and Flute clans formed the nucleus of the ancient pueblo of which Walpi is the survivor. Equally emphatic is the claim of the Snake traditionists that their ancestors came from the north, and other evidence tends to substantiate the assertion. There is little difficulty in tracing a likeness between the kisis of the pueblos and the medicine-lodges of nomadic tribes, but thus far there is nothing to prove the derivation of one from another.

GENERAL REMARKS

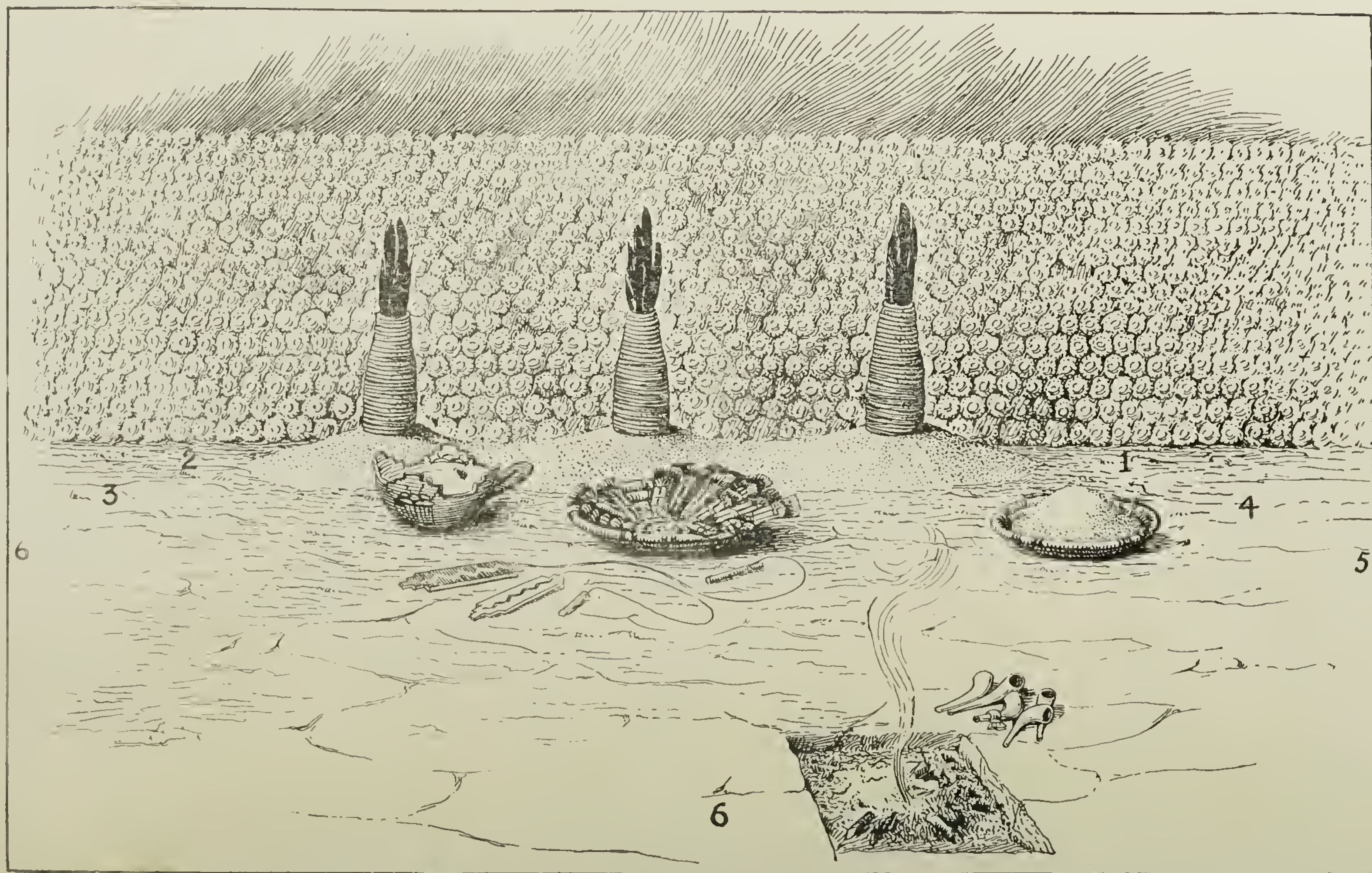
Three elements appear to be prominent in the Flute observance, viz, sun, rain, and corn worship, symbols of which are the most prominent on the altars and their accessories. The same is true of the Snake dance; but in both rites the cultus heroes and clan mothers are special deities to which the supplications for rain and corn are addressed. This is interpreted as a form of totemism in which the ancestors of the clan take precedence. The Sun as the father of all cultus heroes and the Earth as the mother of all gods, ancestral and otherwise, necessarily form an important part of the worship, which is traceable throughout both ceremonies.

Relation of Snake Society and Snake Clan

The Hopi ritual, or that part of it which pertains to communal worship, making up the yearly calendar, bears evidence of being composite, and we may suppose that it has become so for the same reasons that the social system of the Hopi is composite. It is composed of a collection of ceremonies which have come together, yet remain distinct. In the traditional account of the growth of Walpi, for instance, it is stated that families drifted to the site of the pueblo from different directions, and as they arrived certain sections of the village were assigned to them for their homes; these sections their descendants still occupy. By mutual consent each clan was allotted certain tracts of land in the plain for their farms, and these land holdings still remain in the clans. While the clans were living together, a community of interest developed and intermarriage broke down the limitation of sacerdotal societies to clans. Certain emergencies arose when clans were forced to act together. These influences resulted in an amalgamation of clans, and a new organization was effected. The clan languages were fused into a common speech, and a coalescence of the different arts and customs also occurred. The new organization retained much that was good in each of component clans.

The ritual developed along the same lines, but the religious sentiment being more conservative, the clan units have remained more apparent in the rites than elsewhere. When each new family joined the already established villagers, it brought its own mythology and ritual clustering about a special cultus hero and clan mother, or tutelary ancestral couple and, after the union with other clans continued to practice its own clan rites. The germ of that clan ancients worship was evidently ancestor worship. The Hopi ritual is thus a composite of several distinctive clan units.

The Snake dance and the Flute observance are two of these units—one the clan worship of the Snake clans, the other that of the Flute clans. Moreover, since these two clans were among the first to unite and form the nucleus of Walpi, their clan rites must necessarily have been practiced side by side for a longer time than those of most other clans. Hence we should expect to find mutual reaction and many pronounced similarities, which account for the ritualistic resemblances noted, and also afford a verification of the legend of the antiquity of the Snake and Flute ceremonies at Walpi; but there is nothing to show that they are older than the others, although good evidence exists that they have been observed at Walpi for a longer time than any other forms of clan worship. It would be interesting to know the sources and characteristics of the subsequent increments to the Walpi ritual, but the Snake and Flute clan rites are preeminently attractive to the ethnologist.



FIRST FLUTE ALTAR AT WALPI

A correct determination of the relationship between the clan and the sacerdotal society is important if we would gain a clear idea of the character and history of the Hopi ritual. There is no doubt that at present the sacerdotal society includes in its numbers members of several clans, and is not confined to any particular one. Consequently those who conclude that the two organizations are distinct at the present time are justified in that conclusion; but that does not prove that they always were distinct. Evidently in ancient times, when all the inhabitants of Wálpi belonged to the Snake clans, the Snake priesthood was limited to that clan, and if the inhabitants of that ancestral pueblo celebrated the Snake dance it was, strictly speaking, a family affair. After the Flute, the Rain-cloud, Badger, and other groups of clans joined the Snake village, men from these clans became members of the Snake priesthood, giving the present composite personnel which intermarriage made inevitable. The retention of the Snake chieftaincy in the Snake clan in a matriarchal line of descent is one of the many survivals of the former limitation of the Snake priesthood to the Snake clans. A custom in passing the pipe in the ceremonial smoking is another survival. The terms "father," "grandfather," "son," "brother," "elder brother," "younger brother," which are exchanged at that time do not now indicate clan relationship, as hitherto explained, but are survivals of a time when they did. A youth of 18 may be called "grandfather" by a man of 60, and when Hahawe passes the pipe to Wiki and calls him "my elder brother," and Wiki responds "my younger brother," neither of these priests means that the other is his clan relative—it is the relationship of the sacerdotal standing of one to the other that is indicated. The terms are survivals of a time when they meant blood kinship, for when the ceremony was limited to the clan, Wiki, the chief, was "elder brother," or "father," or "grandfather," to the man who thus addressed him. The formal address survives, although the man using it may now belong to a different clan from that of the chief.

Relation of the Flute Society and Flute Clan

In the same way that the Snake and Antelope fraternities are or were directly related to, and were introduced into Walpi by, the Snake and Horn clans, so the Flute societies originated with the Flute clans and were added by them to the participants in the Hopi ritual when they joined preexisting families. Before the Flute clans came to Walpi, bringing their cultus, they had amalgamated with the Horn clans, which had earlier lived with the Snake clans at a place called Tokonabi. Naturally a result of this consolidation was a modification of the Flute ceremony, and the result of this influence was the likenesses between

portions of the Snake dance and the Flute ceremony due to Horn clans common to the Horn-Snake and the Horn-Flute groups of clans.

There is good reason to believe that the Flute clans, and hence the Flute societies, came to Tusayan from the south, whereas the Horn and Snake clans came from the north, or Tokonabi.

Ophiolatry in the Snake Dance

The Snake dance is a celebration or worship of the cultus hero and clan mother (Teüamana) of the Snake clan, but not of the Great Plumed Snake (Palülükoñ), which the legends say was introduced by the Patki clans from the south. These legends are supported by the fact that the effigies of the Plumed Snake are used in the Soyaluña and Palülükoñti ceremonies by the Patki and other southern clans, and not by the Snake society in its worship. No reference to Palülükoñ occurs in the legend of the Snake clans, but a figure of it is painted on the kilts of the Snake priests. These facts have led to the belief that the worship of a Great Snake was foreign to the ritual of Walpi when its population was composed only of Snake, Horn, and Flute clans; that it came to Walpi after the Snake clan was established in that pueblo, and hence presumably after the Snake dance had been introduced. The presence of reptiles in the Snake ceremony is generally supposed to show that this rite is a form of snake worship. It is rather a worship of the ancestors of the Snake clans, which are anthropo-zoömorphic beings, called the Snake youth and the Snake maid; but neither of these represent the Great Snake, nor has their worship anything to do with that of this personage, who was introduced into Hopi mythology and ritual by the Rain-cloud clans. As personated in the Antelope kiva at Walpi, these ancestral beings have no reptilian characteristics, and the snakes which are introduced in the ceremonies are not worshiped, but are regarded as the "elder brothers" of the priests. It is not supposed that these reptiles have any more power to send rain than the "elder brothers" or shades of deceased members of any other society. They are intercessors between man and the rain gods, and if the proper ceremonies with them are performed in prescribed sequence and in traditional ways, the rains must come because they came in the ancient times in the house of the Snake maid. The idea of magic permeates the whole ceremony, which is not an appeal to a great Snake deity to grant any definite request, but a compulsion of the rain and growth supernaturals to perform their functions, which is brought about by the use of proper charms.

The Hopi conception of the rain gods involves no limitation of these supernaturals to definite numbers. There is no suggestion of a single anthropomorphic being which sends the rain, but Rain-cloud spirits are associated with the six cardinal points, and are regarded as ancestral beings.

CAKWALEÑYA ALTAR SLABS AT WALPI

A HOEN & CO. LITHOCAUSTIC BALTIMORE

Relative Place of the Snake Dance in Primitive Worship

The present purpose of the Snake ceremony, which in many publications has been confounded with its original aim, is primarily, as has been elsewhere shown, to bring rain and thus to promote the growth of corn; in fact this desire, due to present environment, dominates all the rites of the Hopi ritual. It is believed, however, that this is not original meaning—back of it is a psychic element which the Hopi share with other primitive people whose myths and ritual have not been modified by an arid climate and an agricultural life. We must look more deeply into the subject in order to bring the Snake dance into harmony with the elements of religion in a more primitive mind.

It has been shown that in the Snake ceremony there is no worship of the Great Serpent, and the Snake priests scout the idea that this great deity belonged to their clan worship. In support of their claims it may be mentioned that Palülükoñ is not represented on their altars. The psychic element of religion in the Snake dance is totemic ancestor worship, which is fundamental in the whole Hopi ritual. The reptile is a society totem, the lineal survivor of a clan totem, and the totem ancestor, called the Snake maid, is, generally, like totemic ideas, an anthropo-zoömorphic conception. Members of the society claim immunity from the bite of the snake because it is their totem, and the idea of possession of the shade or "breath-body" of the dead by the snake totem is in accord with universal totemic conceptions.

The Snake dance is simply a form of clan totemism having special modifications, due to environment, to fit the needs of the Hopi. It is a highly modified form of ancestor worship in which the Sun and the Earth, as parents of all, are worshiped, but in which the cultus hero and the ancestors of the clan are the special divinized personages represented in secret rites.

Interpretation of Snake and Flute Rites

The main object of the majority of Hopi ceremonials is the production of rain and the growth of corn. The reason for individual rites must be sought in certain universal principles of religion common to all men. There are three primal elements which permeate all Hopi ceremonies—the gods, the worshiper, and the needs of the latter, or what he wishes to obtain from the former. Ceremony is largely, if not wholly, made up of the methods adopted by the worshiper, man, to influence the gods to grant his wishes, and is directly the outgrowth of prayer, which is a reflection of desire or want, which in turn is the outgrowth of climatic influences. Agriculturists desire rain and crops, and they pray to the gods especially for these things. There are

certain ways of expressing their prayers, which are known as ceremonies—the nature of the prayer being intimately connected with the conception of the nature of the gods and the understanding of the wants of the worshiper by himself.

There are several kinds of prayer, and there is varying development in the accompanying symbolism. The verbal prayer is one type, which is universal. In this the worshiper simply asks the gods in his own language for what he wants. This form of prayer originated at a time when the gods were regarded as zoömorphic and anthropomorphic, and implies a god who speaks and who hears the desires of his worshiper. In the long process of evolution, however, the verbal prayer became something more than a simple request—the words came to have symbolic meanings and as such were media of communion with gods. They became expressions of religious feeling, but were not necessary to the existence of that feeling. Many worshipers were thus led to drop them and to preserve the feeling in silent prayers; others, reverencing the ancient forms, retained the words as symbolic aids. In the growth of religion it was early recognized that the gods had their own language and that possibly they were unable to understand that of men; hence, as has been shown by Powell, there arose and developed a religious gesture language, or an expression of prayer by dramatization. The worshiper in this type of prayer, which may be called dramatic prayer, showed the gods through action what he desired. He combined it with verbal prayer, with symbolic prayer, but the dramatic element was always most striking. Ceremony, in the main, but not wholly, is highly developed dramatic prayer, and the object of dramatic prayer is to show by acting what the worshiper desires.

In order to appeal to the gods in this gesture language, symbolism is largely employed in the paraphernalia used in worship. Let us apply this to the altars. The prayers of agriculturists in an arid environment are necessarily for rain and the growth of crops—in the case of the Hopi, of maize, their national food—and certainly no one, god or human, could look upon a Hopi altar without seeing symbols of these two things—rain clouds, falling rain, lightning, and corn and other seeds. On the altar are placed either the symbols of what is wanted or the objects themselves. To be sure, there are other objects, but these are supplementary, and vary, but rain symbols and corn symbols are universal.

Not only are the desired objects thus symbolically represented as silent prayers to convey the desire to the gods, but personations of ancestral gods, either in the form of idols or representations by human beings, are found on the same altars. These are not the gods—they are only symbols—temporary residences, if you wish, of the gods. Here we have a still more realistic evolution of the dramatic prayer.

The priest prays to this representation of the god by scattering meal upon it, and the god has but to look about him on the altar to know what is wanted. Observe how the pantomime of imitating falling rain is performed in this way. The priest dips his aspergill in the medicine and asperges in turn to the six cardinal points in representation of falling rain, and this is symbolic of what the priest wishes the gods of the six directions to do.

The priest at another time asperges on a sand-picture symbol of a rain-cloud for the same reason—he shows what he wishes the Rain gods to do, viz, to sprinkle the earth with rain.

Again, the priest pours water into his medicine bowl from six directions to show the gods that he desires them to send rain from the six directions of the known world. He blows an immense cloud of smoke on the altar because he wishes clouds to appear. The act has the same significance—it is a prayer for the rain-cloud which the Rain gods may understand. For this purpose also the priest sounds his whizzer—to imitate the thunder which accompanies the rain.

For this same purpose also the figures of aquatic animals—the tadpole and the frog—which supposedly bring the rain, are displayed because they are silent prayers for rain. Hence, also, the Antelope priests wear rain-cloud symbols on their kilts and zigzag lightning marks on their bodies and limbs.

THE WILD RICE GATHERERS OF THE UPPER LAKES

A STUDY IN AMERICAN PRIMITIVE ECONOMICS

BY

ALBERT ERNEST JENKS

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THE WILD RICE GATHERERS OF THE UPPER LAKES

By Albert Ernest Jenks

INTRODUCTION

This memoir was begun with the hope that eventually other somewhat similar studies of American primitive economics might be made which would throw light from an almost new direction on the culture status of the North American Indians. As the economic motive is so dominant among the foremost peoples of to-day, its ascendence must mark a new stage in the measurement of culture. It has been very interesting to find, through this study, three distinct steps in the development of the motive for production, beginning with myth-founded belief and rising to an incipient state of economic consideration. For example, the Menomini Indians absolutely refuse to sow wild rice—their motive is simply that of belief; the Dakota Indians do not sow the grain, but apparently have no myth-founded scruple against it; while among the Ojibwa no such belief seems likely ever to have existed, for they sow the grain from purely economic motive, though such motive is not so dominant as among many maize-producing tribes.

This study has helped to elucidate the culture position of the tribes which used wild rice by showing the motives for production, the effect on the Indian of such quantities of spontaneous vegetal food, the property-right in the rice beds, and the division of labor. It has given a detailed picture of aboriginal economic activity which is absolutely unique, and in which no article is employed not of aboriginal conception and workmanship. It has thrown light upon the almost constant warfare between the Dakota and Ojibwa Indians for two hundred and fifty years. It has shed light also upon the fur trade in a territory unexcelled in the richness of its furs, yet almost inaccessible had it not been for the wild rice which furnished such nourishing and wholesome support to the traders and hunters. It also shows that much of history is wrapped up in native geographic names; and it is hoped that it may help to promote the preservation and retention of such terms. It has suggested new lines of manufacture.

I am indebted to Professor Richard T. Ely, director, and to Professor William A. Scott and Professor Frederick J. Turner, of the school of economics, political science, and history, of the University of Wisconsin, at Madison, where this study was made, for the suggestions and assistance usually given in the preparation of such a thesis.

Most of the historical data was collected in the library of the Wisconsin Historical Society, at Madison. To Mr Reuben Gold Thwaites, secretary and superintendent, and to other members of the library staff, I owe much. By unusual favors and almost constant service they have greatly lessened my labors.

I am also under obligation to Professor F. W. Woll, chemist of the experiment station at Madison, for his painstaking analysis showing the nutritive value of wild rice.

A part of the data was collected by correspondence, and I gladly take this opportunity to thank those gentlemen whose names appear in the subjoined list of correspondents.

But most of all I am indebted to Professor W J McGee, ethnologist in charge of the Bureau of American Ethnology, and to Dr Otis T. Mason, of the United States National Museum, both of whom suggested the subject of this study. Through correspondence and personal conferences Professor McGee has rendered valuable assistance. It is to him also that I owe the opportunity of visiting many wild rice producing Indians in the autumn of 1899, when I obtained additional data and the illustrations for this study.

I am aware that the text of this memoir carries a greater burden of facts than is necessary to prove the points of the thesis. Had the study been published simply as a doctor's thesis, many facts now in the text would have been omitted, or put in footnotes or appendices.

Chapter I

BOTANY

Scientific Names

During the early history of the science of botany the wild-rice plant, with which this memoir deals, received many scientific names. It is today known as *Zizania aquatica*, and is a grass belonging to the order *Gramineæ*, to the lesser tribe *Oryzeæ*, to the genus *Zizania*, and to the species *aquatica*.[1] The word "zizania" appears in the New Testament in the Gospel according to Matthew, xiii, 25, 26, 27, 29, 30, where it is supposed to refer to lolium. The word is translated "tares," and the plant is there spoken of as growing in farming soil among the wheat.[2] However, the plant under present discussion is aquatic, and there is no likeness between the two except in name.

The following table presents a list of various scientific synonyms by which the plant *Zizania aquatica* has been known:[3]

Zizania—Gronovious, ex Linneus, Gen. ed., vol. II (1742), p. 863.
* *Gramineæ*—Bentham and Hooker, f. 3, p. 1115.
* *Elymus*—Mitchell, in Act. Phys. Med. Acad. Nat. Cur., vol. VIII (1748), appendix, p. 210.
* *Fartis*—Adams, Fam., vol. II (1763), p. 37.
Hydropyrum—Link; see Index Generum Phanerogamorum (1888), p. 468.
Melinum—Link, op. cit.
Zizaniopsis—Döll et Aschers; see Index Generum Phanerogamorum (1888), p. 468.
Zizania aquatica—Linn., Mant., p. 295.
Zizania clavulosa—Micheaux, Fl. Bor. Am., vol. I (1803), p. 75.
Zizania effusa—Herb. of Linn. (so marked, but not by Linn.), Jour. Linn. Soc., vol. VI (1862), p. 52.
* *Zizania latifolia*—Turczaninow, Bull. Soc. Nat. M. S. (1825) 105; vol. XXIX (1856), number 1, p. 2.
Zizania palustris—Linn., Mant., vol. II (1771), p. 295.

The *Hydropyrum esculentum* of Link is the same as *Zizania aquatica*. It is asserted[4] that *Z. latifolia* of Japan and eastern Russia is identical with the North American *Z. aquatica*, but Prof. J. Matsumura, of the Imperial University, Japan, writes that the American plant is identical with a plant growing in Japan, Formosa, and eastern China which bears the name *Zizania aquatica*.[5]

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[1] F. Lamson-Scribner in Bull. 7 of the Division of Agrostology, U. S. Department of Agriculture, revised ed., Washington, 1898.
[2] William Darlington, Agricultural Botany, New York, 1847, p. 207.
[3] Those marked * have not been verified; they are from secondary sources.
[4] Bentham in Journal of the Linnæan Society, vol. XIX (1882), p. 54.
[5] J. Matsumura, letter, Dec. 16, 1898.

In America the plant under present consideration is ordinarily known as "wild rice," a term similar to the common names of several other American grasses, thus necessitating some care in distinction. The greatest confusion will arise, doubtless, with *Zizania miliacea*, the only other American plant of the same genus. This latter plant is very common in the brackish waters of the southern states. It is sometimes called "prolific rice," and is said to grow in shallow waters in Ohio and Wisconsin as well as in the south.[1] Some confusion may arise also with plants of the same tribe, such as "little mountain rice" (*Oryzopsis exigua*), a slender perennial found among rocks and canyons and on mountain tops in Montana, Wyoming, Utah, Oregon, and Washington;[2] "white mountain rice" (*Oryzopsis asperfolia*), also a slender perennial, found in the woods in Newfoundland, in eastern United States from Massachusetts and New Jersey to Minnesota, and in the Rocky mountains from British Columbia to New Mexico;[3] "black mountain rice" (*Oryzopsis melanocarpa*), also a perennial, which is reported as growing in open rocky woods in Quebec and Ontario, and to the south as far as Delaware, Kentucky, Missouri, and Minnesota;[4] "small-flowered mountain rice" (*Oryzopsis micrantha*), a slender, erect perennial growing in woods, along river bluffs, and on mountain sides from South Dakota to Nebraska, Colorado, New Mexico, and Arizona;[5] and *Oryzopsis cuspidata*, which grows in dry prairies about Fort Robinson, Nebraska.[6]

Popular Synonyms

In America there are four chief sources from which popular synonyms are derived for the plant under consideration, viz, the French, English, Algonquian, and Siouan languages. Other synonyms arise through dialects and faulty spelling, and still others through ignorance of a foreign language. Below is presented a list of 60 synonyms for the plant in America. Only one reference for each name is given:[7]

Ah-wuh-kah-ne-me-no-min (Ojibwa of Grand Traverse bay)—Schoolcraft, Indian Tribes, vol. II, p. 463.

American rice—Nuttall, Genera of North American Plants, vol. II, p. 210.

Avena fatua—Alex. Henry, Travels, p. 241.

Blackbird oats.

Canadian oats.

Canadian rice—Smith, Dictionary of Economic Plants.

Canadian wild rice—Cyclopedia; or a New Universal Dictionary of Arts and Science, vol. XXXIX.

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[1] Chas. L. Flint, Grasses and Forage Plants, Lincoln, 1890, pp. 29–30.

[2] Lamson-Scribner, American Grasses, 1, p. 113, in Bull. 7 of the Division of Agrostology, U. S. Dept. of Agriculture, revised ed.

[3] Ibid., p. 111.

[4] Ibid., p. 110.

[5] Ibid., p. 114.

[6] Bessey and Webber, Grasses and Forage Plants, Lincoln, 1890, p. 104.

[7] See the bibliography for the complete titles of the references.

Espece de seigle de marais—Relations des Jésuites, 1671, Quebec, 1858, vol. III, p. 39.
Fals avoines—Flint, Geography and History, vol. I, p. 84.
False oats—Neill, History of Minnesota, p. 111.
Fatuis avena—Flint, op. cit., p. 84.
Fausse avoine—Relations des Jésuites, 1670, Quebec, 1858, vol. III, p. 92.
Field riĉe—House of Representatives, 54th Cong., 1st sess., Report 268, p. 7.
Foll avoin—Robt. Dickson in Wisconsin Historical Collections, vol. XI, p. 292.
Folle—Wisconsin Fur Trade Accounts, vol. IV, 1820–21, manuscript 172 (Wisconsin Historical Society manuscript collection).
Folle Avoine—Flore Canadienne, Provancher, vol. II, p. 665.
Folls Avoine—Morse, Report to Secretary of War, appendix, p. 34.
Fols Avoin—Coues, Pike, vol. I, p. 76.
Haferreis—Dietrich und König, Futtermittel, Zweite Auflage, Berlin, 1891, I, p. 585.
Indian oats.
Indian rice—Lamson-Scribner, Useful and Ornamental Grasses; U. S. Dept. of Agric., Div. of Agros., Bull. 3, p. 95.
Mad oats—Kohl, Travels, vol. II, p. 46.
Malomin—J. Long, Voyages and Travels, p. 205.
Ma-no-men—Wisconsin Historical Collections, vol. XIII, p. 443.
Mano′mĭn—Ojibwa Indians on Lac Courte Oreille reservation, Wisconsin, 1899.
Man-om-in—Palmer, Food Products of the North American Indians; Rept. Dept. of Agric., 1870–71, p. 422.
Manominan—Keating, Narrative of an Expedition, vol. II, p. 459.
Manorrin—Lamson-Scribner, Useful and Ornamental Grasses.
Marsh rice (a kind of).
Meno′mä—Hoffman, Menomini Indians, p. 324.
Menomen—Samuel R. Brown, Western Gazetteer, p. 267.
Me-no-maw—Pokagon, letter, Nov. 16, 1898.
Menomene—Flint, op. cit., p. 84.
Menomon—J. Long, op. cit., p. 205.
Mo-no-min—Schoolcraft, op. cit., vol. II, p. 463.
Mon-o-min—Ibid.
Monomonick—New York Colonial Documents, vol. IX, p. 161, note 6.
Muhnoomin—Edw. F. Wilson, Ojebwa Language.
Mun-no-min—Schoolcraft, op. cit., vol. II, p. 463.
Mus-co-se-me-nah—Harmon, Journal, p. 394.
Oats—Radisson, Voyages, p. 207.
Pse—Keating, Narrative, vol. II, p. 459.
Pshu—Edw. Palmer, op. cit., p. 422.
Psin—Schoolcraft, op. cit., vol. I, p. 187.
Psi′na—Winnebago Indians near Elroy, Wisconsin, winter 1898–99.
Rice—Schoolcraft, op. cit., vol. I, p. 187.
Riz du Canada—Flore Canadienne, vol. II, p. 665.
Reed—Lamson-Scribner, Useful and Ornamental Grasses, p. 95.
See-nah—Henry Merrell, Manuscript Winnebago Dictionary.
Siⁿ′-uke′iⁿ—Dorsey, Omaha Sociology, Third Annual Rept. Bur. Ethnol., 1881–82, p. 308.
Squaw rice—White inhabitants, Hayward, Wisconsin, 1899.
Standing corn—Ellis, Recollections, p. 265.
Tuscarora—Flore Canadienne, vol. II, p. 665.
Tuscarora rice—Lamson-Scribner, Useful and Ornamental Grasses, p. 95.
Wasserhafer—Jahresbericht über die Fortschritte der Agrikulturchemie, Fünfter Jahrgang, 1862–63, p. 59.

Wasserreis—Ibid, p. 59.
Water oats—Lamson-Scribner, op. cit., p. 95.
Water rice—Ibid, p. 95.
Wild oats—Coues, Expedition of Z. M. Pike, vol. I, p. 344.
Wild rice—Lamson-Scribner, op. cit., p. 95.

The letter from Professor Matsumura, above referred to, enables me to add a short list of synonyms for the plant and seed from Japan, China, and Formosa, as follows:

Chimaki-gusa (thousand-rolling-grass)—Japan.
Katsubo (water-reed)—Japan.
Komo-gaya (covering-grass)—Japan.
Komo-gusa (matting or covering-grass)—Japan.
Maki-gusa (rolling-grass)—Japan.
Makomo (water-reed)—Japan.
Kau-peh-sung—Formosa.
Kansu (the name for the young shoot)—China.
Hanagatsumi (flower-water-reed-fruit, i. e., the seed or grain)—Japan.
Katsumi (water-reed-fruit, i. e., the seed or grain)—Japan.
Makomo-no-mi (fruit of the water-reed, i. e., the seed or grain)—Japan.

Etymology of "Mano'mĭn"

Of the American synonyms given above, the larger number follow the norm *mano'mĭn*. This is the Algonquian word for wild rice, and it is chiefly through this term that the plant has influenced geographical names in America. The word is a compound of the adjective and adverbial form *me-no*, meaning "good," "right," "well," and of the noun form *min*, meaning "berry." *Me-no* never changes its form in the language, but is used quite variously, as *me-no au-ne-ne*, "good man"; *me-no au-yaw*, "he is getting well." This term and *maw-tchi*, or *mau-tchi*, meaning "bad," and used exactly as is *me-no*, are the most common adjectives in the Ottawa and Ojibwa languages.[1] The form *min* is used in a great many words which denote berry or fruit, as in *au-zhaw-way-min* (beechnut), *ane-she-min* (apple), *shaw-bo-min* (gooseberry), *me-daw-min* (maize), and *mis-koumin* (red raspberry).[2] Among the Algonquian tribes of New England, kinsmen of the Ottawa and Ojibwa Indians, *min* or *meen* is the word for berry or maize, *min* being the general term for berry.[3] Thus *mano'mĭn*, the term by which wild rice first came to be known among the white settlers of the Northwest—the French at Green bay, Wisconsin—is the Algonquian word for the very suggestive and common-sense term "good berry," or "good fruit." The French named the plant *folle avoine* (wild oat, mad oat, or fool oat), and this term and its various faulty renditions are frequently applied to

[1] See Wilson, Ojebwa Language, p. 21; Blackbird, History of the Ottawa, pp. 111, 112.
[2] Blackbird, op. cit., p. 122; see also Wilson and Baraga.
[3] Barratt, Indian of New England, p. 19.

the plant in early accounts of the Northwest. Marquette once called it *fausse avoine* (false oat), and the Latin *avena fatua* was doubtless applied to the plant because of the term adopted by the French. It is difficult to say what the Siouan norm is, but probably it is *psin*, which is often followed by some slightly accented vowel, as in the word *psina*.

Scientific Description

The genus *Zizania* comprises two species, and is well characterized by the unisexual spikelets in an androgynous panicle, each having two glumes, and the males having two stamens. The plant ordinarily grows from 5 to 10 feet high, with a thick, spongy stem and an abundance of long, broad leaves. The chief mark of distinction between the two species is that the *miliacea* bears its male and female flowers intermixed on its fruit head, while the *aquatica* bears its female flowers near the top, where the cylindrical panicle, from 1 to 2 feet long, is quite appressed, and its male flowers on the more widely spread lower branches of the panicle. The glumes or husks of the female or fertile flowers are about an inch long and are armed with an awn or beard usually of about the same length as the husk, but at times of twice its length. The grain, which is inclosed within the glumes, is a slender cylindrical kernel, varying in length from almost half an inch to nearly an inch, and is of dark slate color when ripe. The plant is an annual, and grows in either fresh or brackish waters from a bed of mud alluvium.

Popular Description

Wild rice is one of the most beautiful aquatic single-stem plants in America. The grain is shed into the water when it ripens in the autumn, and lies in the soft ooze of alluvial mud at the bottom of a lake or river until spring, when it germinates and grows rapidly to the surface. Text-books have frequently called the plant perennial. The old stalks die down below the surface of the water before the time arrives for the new ones to appear, so the inference has been made that they all come from the same root; but the plant is an annual, growing from new seed each year. It was called a biennial by the Detroit Gazette December 24, 1820.

Early in June the shoot appears at the surface of the water and at once begins to prepare its fruit head. At about this stage of its growth it has been described as follows:

> When seen from a distance, they [the rice beds] look like low green islands on the lakes; on passing through one of these rice beds when the rice is in flower, it has a beautiful appearance with its broad grassy leaves and light waving spikes, garnished with pale yellow green blossoms, delicately shaded with reddish purple, from beneath which fall three elegant straw-colored anthers, which move with every breath of air or slightest motion of the waters.[1]

[1] Catherine Parr Traill, Backwoods of Canada, p. 237.

The plant blossoms in June, and by September the seeds are mature. The fruit heads are mostly of a pale green color with a tinge of yellow, but at maturity they generally acquire a cast of purple.[1] Rice beds have been described as resembling fields of wheat, of canebrake, and of maize. At maturity the stalks range from 2 to 12 feet in height above the water, and they also vary much in thickness. Their total length depends largely on the depth of the water in which they grow, as well as on the fertility of the soil.

This latter cause affects also the size and strength of the stem. The stalks are most frequently from 5 to 8 feet in length, but they are also found as long as 16 or 20 feet. They grow up through water varying from 12 inches to 10 or 12 feet in depth. Mr L. A. Paddock, of Grass lake, Lake county, Illinois, describes the plant in the most luxuriant growth which it is believed to acquire in America. His description is unique also in the fact that, at Grass lake, after the plant grows to the surface of the water, and until it is 2 or 3 feet long, it lies flat upon the surface. Then as each leaf enlarges and gains strength the stalk straightens up (others have said that if once the young shoot gets down onto the water, it can not possibly rise, but dies without fruitage). By the middle of July the stalks are about 8 feet high. At that time from the center of each stalk a long slender shoot grows to the height of about 4 feet above the topmost leaf. This shoot bears the fruit head. The stalk grows an inch or more in diameter, and to the height of 10 or 12 feet above the water. It grows to this, its greatest height, in water 1 foot deep, but it will grow and mature in water 8 feet in depth, in which case it rises about 4 feet above the surface. The roots are so strong and matted that they will support the weight of a man walking upon the mass in shallow water.[2]

Natural Enemies

An annual plant clearly seems to grow not for itself, but for its successors. Anything which destroys the seeds, even though they have reached maturity and are ready to grow, is as much an enemy of the species as though the parent plant had been destroyed. However, inasmuch as the plant may produce, say, a hundred offspring, the destruction of the plant before the maturity of its seeds may be a hundredfold more serious than the destruction of a mature seed.

It will later be seen that the Indian, by his use of the wild-rice seed, is a great enemy of the plant, for it will be shown that the plant, unless it is artificially sown, is gradually being extinguished in such beds as are continually used. Waterfowl in countless numbers feed upon the grain at its maturity. In fact, it is so choice a food for duck, geese, teal, and other waterfowl that it is now quite frequently sown by gun

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[1] Elliott Coues in Botanical Gazette, Dec., 1894, p. 506.

[2] Paddock, letter, January 20, 1899.

clubs in mud-bottomed waters in hunting preserves to attract such fowl for shooting.[1]

Many descriptions are given of clouds of blackbirds, redwing blackbirds, and ricebirds which subsist on the grain during and immediately after its milk stage.[2] Rails, pigeons, quails, herons, cedar birds, woodpeckers, and many other birds also consume the grain by feeding from the heavy stalks.[3]

Caterpillars have been known to destroy an entire crop of wild rice in the neighborhood of Rainy river.[4] Mr Pither mentions a worm which eats into and destroys the grain in Manitoba, Canada.[5] This is probably the "maggot," which is the larva of the water weevil (*Lissorhoptrus simplex*). The "maggot" is a very small white legless grub; it destroys the plant by working in its roots, while a beetle, the water weevil just cited, eats the leaves of the plant.[6]

A fungus, *Entyloma crastophilum*, Sacc.(?), works in the sheath of the grain,[7] while *Claviceps sp.* also works on the plant,[8] and in Japan the fungus *Ustilago esculenta* attacks the shoot.[9]

A fungus, *Claviceps purpurea*, occurs quite commonly on the grain in northern Wisconsin, where the Indians speak of it as "frozen rice." In its early stage it consists of a profuse growth of mycelium in the tissue and on the surface of the young ovary. The product is a compact, horn-shape, dark body called the sclerotium, which occupies the position of the displaced ovary. The sclerotium lies dormant during the winter, and in the spring germinates by forming tiny spores which free themselves, and begin growth in the tissue and in the ovary, as is told above.[10]

Storms, frosts, and floods cause great, doubtless the greatest, damage to wild rice.[11]

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[1] See chapter VI for the consumption of wild rice by these game birds.

[2] The most common of these blackbirds, all of which are fond of wild rice, are the purple grackle (*Quiscalus quiscula*), the boat-tailed grackle (*Q. major*), and the rusty grackle (*Scolecophagus carolinus*). The redwing or swamp blackbird (*Agelaius phœniceus*) forms large migratory flocks in the autumn in all of the Northern states, and becomes very destructive to the grain. The ricebird, reedbird, or bobolink (*Dolichonyx oryzivorus*) is the natural bird enemy of wild rice, and is found in countless numbers in all—both brackish and fresh water—wild-rice marshes during the autumn.

[3] Pither, letter, December 5, 1898; McKenney, Memoir, vol. II, p. 104; Hind, Narrative, vol. I, p. 118. The sora rail (*Porzana carolina*), the yellow rail (*P. noveboracensis*), and the black rail (*P. jamaicensis*) feed upon wild rice. The sora rail is especially common in fresh-water wild-rice marshes. For references to great numbers of waterfowl in Minnesota, see Schoolcraft, Indian Tribes, vol. I, pp. 186–187, vol. IV, pp. 193–194. For the waterfowl on Fox river, see Brown, Western Gazetteer, pp. 252, 261; also Schoolcraft, Summary Narrative, p. 183, and Featherstonhaugh, Canoe Voyage, vol. I, p. 180.

[4] See chapter VI (page 1100).

[5] Pither, op. cit.

[6] L. O. Howard, Insects Affecting the Rice Plant, in Rept. of the Commissioner of Agric. for 1881 and 1882, Rept. of the Entomologist, pp. 127, 138.

[7] Wm. Trelease, Preliminary List of Wisconsin Parasitic Fungi, in Wis. Acad. Sci., Lit., and Arts, vol. VI, number 258; Madison, 1885, p. 139.

[8] Ibid., number 66, p. 115.

[9] Matsumura, letter, December 16, 1898, with reference to Henning's Hedwigia, Band XXXIV, 1895, p. 10.

[10] Lucius E. Sayre, A Manual of Organic Materia Medica and Pharmacognosy, etc.; Philadelphia, 1895, p. 439.

[11] See chapter VI. Very little scientific attention has been given to *Zizania aquatica;* consequently the present treatment of its enemies is scanty. Answers to letters of inquiry lead to the conclusion that more careful attention will be given it in the near future.

Chapter II

HABITAT

Introduction[1]

Zizania aquatica grows in North America from about latitude 50° on the north to the Gulf of Mexico on the south, and from the Atlantic ocean to the Rocky mountains. In Manitoba it extends farther northward than 50° in the Winnipeg drainage, and in Ontario toward Hudson bay. It grows abundantly in the brackish, almost stagnant, waters of the Atlantic and Gulf states, and along the sloughs of Mississippi river from its headwaters as far south as the state of Mississippi; indeed it doubtless occurs along the entire course of this river. It fringes the north shore of Lake Ontario, the northwest, west, and southwest shores of Lake Erie, Georgian bay of Lake Huron, the shore of Lake Huron south of Georgian bay, St. Clair lake, and Green bay of Lake Michigan. Besides growing in these great waterways, it flourishes in countless small lakes, ponds, and streams in the eastern half of the United States. It is especially abundant in the region which this memoir designates the "wild-rice district."[2] In fact, the plant is quite common in the United States east of the Rocky mountains, and in Canada as far north as latitude 52°, in lakes, ponds, and slow-flowing streams which have an alluvial bed. Nowhere will it grow in water having a sand or clay bed, or in swiftly flowing streams.

Habitat by States

In this section is presented the wild-rice habitat in the various states so far as data could be collected (see plate LXVI).

Alabama. Common in the middle section along streams (letter of P. H. Mell, Auburn, Alabama, May 1, 1899).

[1] In the preparation of this chapter text-books on botany have been of little or no assistance. They have very generally given the habitat of *Zizania aquatica* in such indefinite language as the following: "Common from Nova Scotia to Florida and west to Minnesota." For the material of this chapter correspondence has been conducted with college and university teachers of botany and with directors of experiment stations in most of the commonwealths of the United States and Canada. The effort has been to gather data from each section so that a fairly representative habitat may be described. Perhaps the most striking result of the investigation is that which shows how limited the knowledge of some of our economic plants is, and that, too, in states in which they are common. It is to be hoped that more attention will be given to a systematic study of our economic plants.

Prof. J. W. Harshberger presents the following reasons for the study of ethno-botany, a term which well might be ethno-economic-botany: It aids in elucidating the culture-position of the tribes which used the plant; it helps in deciding the ancient trade routes; and it suggests new lines of manufacture to-day.—Harshberger, The Purposes of Ethno-botany, Botanical Gazette, March, 1896, p. 146 et seq.

[2] See chapter VI. This wild-rice district is Wisconsin (except its southwestern part) and a part of eastern Minnesota.

ARIZONA. Not known (letter of J. W. Toumey, Tucson, Arizona, December 7, 1898).

ARKANSAS. Not in an extensive collection made by Prof. F. L. Harvey (letter of Jerome McNeill, Fayetteville, Arkansas, December 21, 1898). Charles Pickering says (History of Plants, Boston, 1879, p. 772) that Nuttall observed it along the Arkansas river. It also occurs along the Mississippi.

CALIFORNIA. Not known (letter of J. Burt Davy, Berkeley, California, December 6, 1898).

COLORADO. Not known; it was twice introduced but failed to grow (letter of C. S. Crandall, Fort Collins, Colorado, December 12, 1898). However, the Indians gathered it near Denver in 1872.

CONNECTICUT. Common near New Haven (letter of Alex. W. Evans, New Haven, Connecticut, January 3, 1899). It grows also in the brackish coastal marshes which are submerged most of the time, and also along Connecticut river, as at Essex.

DELAWARE. Catalogued by Tatnall as being "very common" in "ditches and muddy banks of streams" in Newcastle county (letter of W. H. Bishop, Newark, Delaware, December 12, 1898). Featherstonhaugh (A Canoe Voyage up the Minnay Sotor, London, 1847, vol. I, p. 180) says it is very common near Newport. Lamson-Scribner (Useful and Ornamental Grasses, p. 95) asserts that it is abundant in Delaware river below Philadelphia, where it is always called "the reeds."

DISTRICT OF COLUMBIA. Abundant along the Potomac, covering areas of many acres (letter of F. Lamson-Scribner, Washington, April 25, 1899).

FLORIDA. Very abundant. It occurs in deep ponds in Columbia and Suwannee counties. "I think I have also seen it in Orange, Lake, and Sumter counties, together with several others" (letter of P. H. Rolfs, biologist and horticulturist, Florida Agricultural College and Experiment Station, Lake City, Florida, December 10, 1898). Pickering (op. cit., p. 771) says that Pursh received a specimen of the plant from Florida. MacCauley (Seminole Indians of Florida, in Fifth Annual Report Bureau of Ethnology, p. 504) says that the Seminole Indians gather in the swamps all the rice they need.

GEORGIA. Grows in Clark county and elsewhere in small quantities (letter of John P. Campbell, Athens, Georgia, April 13, 1899).

IDAHO. Not known, and probably not found west of the Rocky mountains (letter of L. F. Henderson, Moscow, Idaho, December 11, 1898).

ILLINOIS. Quite common in Carroll county, Bluff lake in Union county, and in ponds formed by Illinois river in Peoria and Fulton counties (letter of G. P. Clinton, Urbana, Illinois, May 3, 1899). It is also very abundant (one thousand acres) in Grass lake, Lake county (letter of L. A. Paddock, Grass lake, Lake county, Illinois, January

20, 1899). It also grows plentifully in sloughs of the Mississippi and in small streams in Jo Daviess county.

Indiana. Found in Gibson, Monroe, and La Porte counties.

Indian Territory. Not known (letter of A. Grant Evans, Muscogee, Indian Territory, April 25, 1899).

Iowa. Common, especially in the northern and central parts. It has been collected in Emmet, Scott, Delaware, Clinton, Linn, Humboldt, Johnson, Louisa, Hancock, Wright, Story, and Fayette counties (letter of B. Shimek, Iowa City, Iowa, December, 1898).

Kansas. Not known (letter of A. S. Hitchcock, Manhattan, Kansas, April 24, 1899).

Kentucky. Grows in lakes in the "barrens" in the western part of the state (letter of C. W. Mathews, Lexington, Kentucky, December 15, 1898).

Louisiana. "Occurs plentifully in all the lower counties" (letter of George E. Beyer, New Orleans, Louisiana, December 19, 1898; also letter of A. B. Langlois, St Martinville, Louisiana, November 21, 1898).

Maine. Abundant in Aroostook county in the Mattawamkeag river system; very abundant in the Penobscot river system above tidewater. It is also abundant in Kennebec county on Messalonskee river and other tributaries of the Kennebec, and it is found in Franklin county along Sandy river. "Doubtless the plant is common in other waters in central Maine" (letter of M. L. Fernald, Gray Herbarium, Cambridge, Massachusetts).

Maryland. Abundant in Anne Arundel county, and probably in other counties bordering on Chesapeake bay (letter of N. W. Barton, Baltimore, Maryland, about December 10, 1898).

Massachusetts. Rather common in many streams and ponds in eastern Massachusetts, in at least Essex, Middlesex, and Norfolk counties. It is found also in Connecticut river at Northampton, in Hampshire county (letter of M. L. Fernald, Gray Herbarium, Cambridge, Massachusetts, December 12, 1898).

Michigan. Found throughout the state in mud-bottomed lakes and sluggish streams; also found commonly in Grand river valley (letter of C. F. Wheeler, Michigan Agricultural College post-office, Michigan). It is found also in Huron river, Washtenaw county (letter of F. C. Newcombe, Ann Arbor, Michigan, December 9, 1898). The plant is also very abundant in St Joseph river in southwestern Michigan, and is found also in various streams and small alluvial lakes in Kalamazoo and Barry counties.

Minnesota. See the "Wild-rice District," in the present chapter, pages 1033–1036.

Mississippi. Common in the extreme southern part of the state (letter of S. M. Tracy, Agricultural College, Mississippi, January 6, 1899). It is found also along Mississippi river.

MISSOURI. No data through correspondence.

MONTANA. Not known (letter of J. W. Blankinship, Bozeman, Montana, December 12, 1898).

NEBRASKA. Grows throughout the state (letter of Charles E. Bessey, Lincoln, Nebraska, December 9, 1898). It also occurs in swamps in the sand hills near Whitman, Grant county (Dept. of Agric., Div. of Botany, U. S. Nat. Herbarium, vol. III, p. 187).

NEVADA. Not known (letter of Marcus E. Jones, Salt Lake City, Utah, December 23, 1898).

NEW HAMPSHIRE. Found in Androscoggin river (letter of Henry C. Jessup, Hanover, New Hamphire, December 13, 1898).

NEW JERSEY. "Common in most districts," in lakes and ponds and tidal waters, especially in Delaware river (letter of G. Macloskie, Princeton, New Jersey, December 15, 1898). A fossil grass with a broad leaf was discovered in the Yellow Gravel at Bridgeton, which Dr N. L. Britton, of New York City, says perhaps is *Zizania* (Transactions N. Y. Academy of Sciences, November 24, 1884, p. 31; also Proceedings Am. Assoc. Adv. Sci., vol. XXXI, 1882, p. 359).

NEW MEXICO. Not known (letter of E. O. Wooton, Mesilla Park, New Mexico, December 22, 1898).

NEW YORK. It was collected in large quantities by the Seneca and other Indians in 1870.

NORTH CAROLINA. Common in low and submerged districts (letter of H. V. Wilson, Chapel Hill, North Carolina, February 15, 1899). Notes on Grasses and Forage Plants of the Southern States (U. S. Dept. of Agric., Div. of Agros., Bull. 1, 1895, p. 34) says it grows near Wilmington, New Hanover county; see also Gerald McCarty in Botanical Gazette, vol. X, 1885, p. 385.

NORTH DAKOTA. Grows in Ramsey and Benson counties in Sweetwater lake and in Twin lake, where it is very abundant, and also in Devils lake (letter of Melvin A. Brannon, Grand Forks, North Dakota, December 10, 1898). Coues (New Light on the Greater Northwest, vol. I, p. 138) says that in 1800 wild rice was plentiful in a marais (now Morse's slough) at Washville, Walsh county. It is also quite plentiful in the Dakotas, east of the Mississippi. It is often so abundant in Sioux river as to cover the entire bed for long distances (Grasses and Forage Plants of the Dakotas, U. S. Dept. of Agric., Div. of Agros., Bull. 6, p. 17).

OHIO. Grows in the state as far south as 40 miles below Columbus, and is also reported from Cincinnati in the catalog of Joseph F. James (letter of W. E. Kellerman, Columbus, Ohio, May 18, 1899). It grows also in the shallow waters of Lake Erie.

OREGON. Not known (letter of E. R. Lake, Corvallis, Oregon, December 30, 1898).

PENNSYLVANIA. Abundant along Delaware river and its tributaries, but probably does not extend far inland (letter of John R.

Macfarlane. Philadelphia, December 12, 1898). It is reported in Brandywine river, in Chester county, by Flora Cestrica, p. 93, edited in Westchester, Pennsylvania, 1837. Thomas C. Porter (A List of the Grasses of Pennsylvania, Bulletin of the Torrey Botanical Club, vol. xx, 1893, p. 197) says that it grows in Lancaster county above Shocks Mill.

Rhode Island. Occurs in Providence county (letter of J. Franklin Collins, Providence, Rhode Island, May 4, 1899).

South Carolina. No data through correspondence.

South Dakota. Abundant in streams tributary to Sioux, James, and Little Minnesota rivers, and throughout eastern South Dakota (letter of D. W. Saunders, Brookings, South Dakota, January 4, 1899; see also Grasses and Forage Plants of the Dakotas, U. S. Dept. of Agric., Div. of Agros., Bull. 6, p. 17). It is also reported from Huron, Tacoma, Brookings, and Sioux Falls counties.

Tennessee. Not known (letters of Samuel McBain, Knoxville, Tennessee, December 9, 1898, and November 27, 1899).

Texas. "Grows in Texas, presumably in south and east Texas, abundantly" (letter of William M. Bray, Austin, Texas, December 13, 1898). Coulter (Dept. of Agric., Div. of Bot., U. S. Nat. Herbarium, vol. I, p. 55) says that it is found in the region of the Rio Grande "between Brazos Santiago, and El Paso county."

Utah. Not known (letter of O. Howard, Salt Lake City, Utah, December 13, 1898).

Vermont. Grows in abundance in Lake Champlain valley in at least Franklin, Chittenden, Addison, Rutland, and Grand Isle counties (letter of L. R. Jones, Burlington, Vermont, December 27, 1898).

Virginia. Not known in the Allegheny or Piedmont regions, but is found in the Potomac flats (letter of A. H. Tuttle, Charlottesville, Virginia, January 17, 1899).

Washington. No data through correspondence.

West Virginia. Not known (letter of W. E. Rumsey, Morgantown, West Virginia, December 17, 1898).

Wisconsin. See the "Wild-rice District," in the present chapter.

Wyoming. Not known (letter of Aven Nelson, Laramie, Wyoming, December 12, 1898).

During the first quarter of the nineteenth century wild rice grew quite extensively in that expanse of the United States lying between the Mississippi river and the Rocky mountains.[1]

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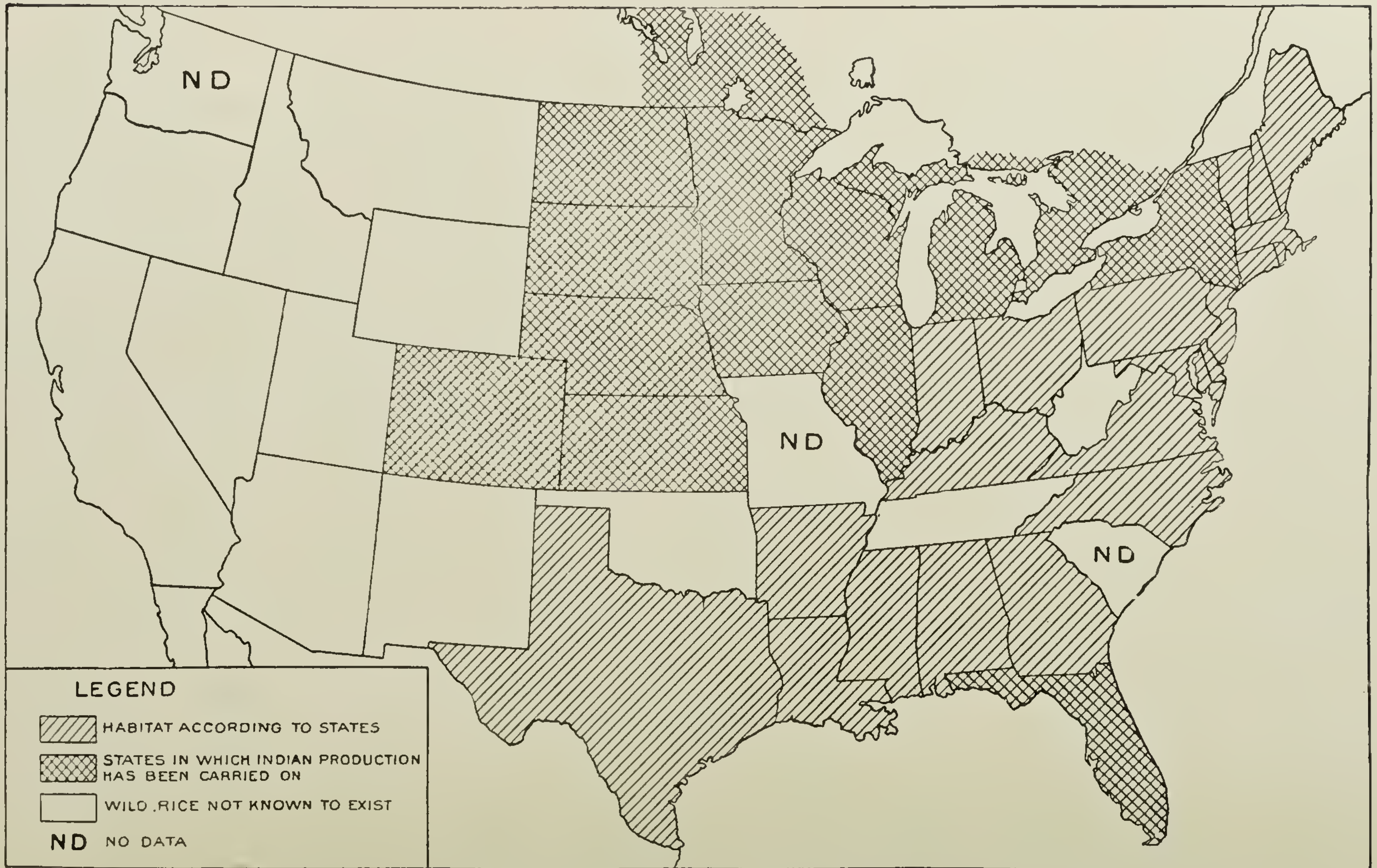
[1] Mr John Dunn Hunter was a captive from childhood to young manhood among the Osage Indians, and during the first quarter of the nineteenth century roamed over "the Missouri and Arkansas country," which he describes as being "bounded on the east by the state of Missouri and Mississippi river; north by the British dominions; west by the Rocky mountains; and south by the Arkansas river and territories of the Mexican empire" (Hunter, Memoirs of a Captivity, pp. 137, 138). He classifies the lands of this extensive territory under five heads, as follows: (1) Alluvial or river bottom, (2) fertile prairies, (3) hills, (4) morasses or swamps, (5) barrens or sterile prairies. He says of the morasses or swamps, "In general they afford the wild rice, from which, after the buffaloes and other grazing animals have tramped over it, the Indians collect their supplies" (ibid., p. 142).



WILD RICE HABITAT, BY STATES

Thus it will be seen that *Zizania aquatica* occurs in all the commonwealths of the United States, so far as ascertained by correspondence, except in Arizona, California, Colorado, Idaho, Indian Territory, Montana, Nevada, New Mexico, Oregon, Tennessee, Utah, West Virginia, and Wyoming. Most of these states lie in or west of the Rocky mountains. It is believed that the plant grows in both West Virginia and Tennessee, but it has not yet been reported.

There are three states from which no data have been collected, viz, Missouri, South Carolina, and Washington. It is believed that the plant grows in the former two.

Habitat in the Wild-rice District

Wherever the last glacier left little mud-bottomed, water-filled hollows, there wild rice has established itself, if other conditions are favorable. Such ponds and lakes are characteristic of the alluvial apron spread out over Wisconsin and Minnesota. In 1817 the interior of Wisconsin is spoken of as watered with innumerable small lakes and ponds which generally abound with folle avoine [wild rice], waterfowl, and fish, each in such prodigious quantities that the Indians are in a manner exempt from the contingence of famine.[1]

Within the wild-rice district sluggish streams and quiet bends in the rivers and creeks also produce wild rice, provided the bed is mud alluvium. The grain has followed the stream toward its mouth, the waterfowl has sown it in its flight, and the Indian has carried it to his favorite lakes and streams, until to-day it is safe to say that the grain is found wherever in these two states there is suitable soil (see plate LXVII *a*).

Before the middle of the seventeenth century wild rice was reported as the staple food of the Menomini Indians, and as being very plentiful on what is now Menomini river, the boundary between Wisconsin and the upper peninsula of Michigan. Indian tradition first speaks of the grain as being found in this stream, and from here as a starting place the present memoir will follow the plant along the various waterways of the wild-rice district. Green bay, from above the mouth of Menomini river southward to the bay-head, has been fringed with the plant from earliest historic times, and to-day there are thousands of acres of wild rice in the shallows of its waters. Most of the streams which discharge into it—all of those which are suitable—bear the grain abundantly. Fox river, from Lake Winnebago to its source, has been reported as filled with wild rice from the time of Marquette, who spoke of it in 1673 as follows: "The way is so cut up by marshes and little lakes that it is easy to go astray, especially as the river is so covered with wild oats that one can hardly discover the channel."[2] Carver, in

[1] Samuel R. Brown, Western Gazetteer, p. 252.
[2] Quoted by Thwaites in Historic Waterways, Chicago, 1888, pp. 156, 157.

1767, wrote, "in fome places it is with difficulty that canoes can pafs, through the obftructions they meet with from the rice ftalks, which are very large and thick."[1] Featherstonhaugh wrote, in 1847, that near Fort Winnebago there were several thousand acres of wild rice. He estimated the fields as at least 5 miles long and 2 miles wide.[2] He said that on Fox river they were obliged to stop paddling and "all took to warping the canoe through by hauling upon the tall stalks."[3] In 1888 a writer stated that north of the portage of the Fox and Wisconsin rivers, "as far as the eye can reach, there is a stretch of wild-rice swamp."[4]

Fox river illustrates well the influence of the current upon the existence of wild rice. From the portage between the Fox and Wisconsin rivers to Lake Winnebago, Fox river is 104 miles long, with a total fall of only 40 feet, and, as has been seen, it is filled with the plant. On the other hand, from lake Winnebago to Green bay, where the stream is only 37½ miles long, with a fall of 170 feet, the plant does not flourish.

Wild rice is found along Wisconsin river even below the portage just referred to,[5] while the headwaters of the Wisconsin are often dense wild-rice beds. Wolf river and its tributaries also grow the plant.

The upper waters of the Red Cedar, Chippewa, and St Croix rivers are filled with the growth, and it is from this supply that the Ojibwa Indians of Lac Courte Oreille reservation gather their annual crop[6] (see plate LXVII *b*). In speaking of the Menomini, Wolf, Fox, Wisconsin, Red Cedar, Chippewa, and St Croix rivers and systems, it must be remembered that the various lakes, ponds, and streams in all this section of country are considered.

Although Dr Jedidiah Morse[7] reported in 1822 that wild rice did not grow within 150 miles of Lake Superior on the south, yet it is now annually gathered in many of the streams flowing into Lake Superior from this region, and in 1860 J. G. Kohl stated that "the plant is very prevalent in the southern part of the lake [Lake Superior]."[8]

The headwaters of Mississippi river in Minnesota are in the heart of the Minnesota rice fields.[9] The regions about Mille Lacs, Leech lake, Sandy lake, Gull lake, and Lake Winnibigoshish, all draining into the Mississippi, are abundantly supplied with wild rice.[10] Maps

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[1] Carver, Travels, p. 38; see also p. 536. Brown, Western Gazetteer, p. 261. Coues, Pike, vol. I, p. 302.

[2] Featherstonhaugh, Canoe Voyage, vol. I, p. 184.

[3] Ibid., p. 190.

[4] Thwaites, op. cit., p. 145; see also Edward Tanner in Detroit Gazette, January 15, 1819.

[5] Atwater, Indians, p. 181.

[6] Mrs Ellet, Summer Rambles, pp. 151, 152; also Schoolcraft, Thirty Years with the Indian Tribes, pp. 369, 373, 380, 383, 385; Schoolcraft, Summary Narrative, appendix, p. 543; Carver, Travels, p. 533; also Report of the Commissioner of Indian Affairs, 1850, p. 54.

[7] Morse, Report, appendix, p. 30.

[8] Kohl, Kitchi-Gami, pp. 117–118.

[9] Schoolcraft, Indian Tribes, vol. IV, pp. 193–194; also Schoolcraft, Summary Narrative, pp. 134, 235, 239, 249.

[10] Hennepin, Nouvelle Découverte, p. 313* (fol. O*4). See also Indian Affairs Report, 1850, pp. 56, 61; Schoolcraft, Indian Tribes, vol. I, pp. 186–187.

of fifty years ago present a "Great Rice M[arsh]" as extending along Minnesota river (then generally represented as the St Peters) from its juncture with the Mississippi at St Paul up as far as Beaver falls in Renville county, Minnesota;[1] and Carver said of this country in 1767, "Wild rice grows here in great abundance."

Lakes and streams draining into Red river of the North, between Minnesota and Dakota, are also Minnesota wild-rice fields.[2] One of these streams is Wild Rice river, which has its source in two lakes bearing the name Rice, which also lie in Minnesota. Another is Pse river, whose source is in the Dakotas. Farther north, the lakes and streams emptying into Lake of the Woods, Rainy lake, and the Winnipeg system in general, are mainly wild rice producing waters.[3] Mackenzie said in 1801:

> Vaft quantities of wild rice are feen throughout the country [from Lake Superior to Lake Winnipeg], which the natives collect in the month of Auguft for their winter ftores.[4]

Seymour wrote of Lake of the Woods, in 1850:

> The indentations of its rocky, moss-covered shores are full of the wild rice, which is annually collected in large quantities by the Indians.[5]

Farther south the St Louis river system tells the same tale—the streams all bear abundant stores of wild rice.[6] In 1883 the plant was reported from Minnesota as being "common, or frequent, in favorable situations throughout the State; sometimes attaining, in Brown county, a height of 13 feet, with leaves 4 feet long."[7] Chapter VII of the present memoir still further aims to show the extent of wild rice, where Indian production was carried on, as exhibited by its influence on geographic names.

Some idea of the prevalence of wild rice in the lakes of this district may be obtained from the following characteristic quotations:

> The Indians around Sandy lake [Aitkin county, Minnesota], in the month of September, repair to Rice lake, to gather their rice. In no other place does it grow in as large quantities as there. This lake is about 5 miles long and 3 broad. It might, perhaps, be called a Marrais, for the water is not over 5 feet deep, and its surface is almost entirely covered with rice. It is only in morasses, or muddy bottoms that this grain is found.[8]

Warren writes of Mille Lacs in 1852, that it is a circular lake about 20 miles across and abundantly stocked with fish. Connected with it

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[1] Map accompanying Carver's Travels. See also Schoolcraft, Indian Tribes, vol. II, p. 97.

[2] Lord Selkirk's Settlement in North America, p. 120. See also Western Journal, May, June, July, August, vol. II, number 5, 1849; Keating, Narrative, vol II, p. 37.

[3] Harmon, Journal, pp. 44, 45, 142. See also McMillan, Observations on the Distribution of Plants along shore at Lake of the Woods, pp. 949–1023, in Minn. Bot. Studies, Bull. 9, parts 10 and 11, p. 994. Hind, Narrative, pp. 96, 97, 115, 116, 118.

[4] Mackenzie, Voyages, pp. 61, 62.

[5] Seymour, Sketches of Minnesota, p. 233.

[6] Schoolcraft, Summary Narrative, p. 112; also Indian Affairs Report, 1891, vol. I, p. 471.

[7] Upham, Catalogue of the Flora of Minnesota, p. 159.

[8] Edward Tanner, Detroit Gazette, December 8, 1820.

is a string of marshy or muddy-bottomed lakes in which the water is but a few feet deep, and wherein the wild rice grows luxuriantly. "Possessing these and other advantages," he says, "there is not a spot in the northwest which an Indian would sooner choose as a dwelling place than Mille Lacs."[1]

Jefferson Davis wrote, in 1885, that in 1829 in the country about "Tay-cho-pe-rah," "The four lakes country," i. e., Madison and its vicinity, in Wisconsin, "the Indians subsisted largely on Indian corn and wild rice."[2] In 1816 the grain was gathered in Rock river, Wisconsin, and chapter VII will show that the plant existed throughout the southeastern part of the State.

A general view of wild rice in Wisconsin and Minnesota was given by Upham in 1883, who quotes as follows:

> Wild rice . . . acquires in the Northwest an economical importance second to no other spontaneous production. It is the only instance in this region of a native grain, occurring in sufficient quantity to supply the wants of ordinary consumption. It is particularly abundant on the lake-like expansions of rivers, toward their sources, which give such a marked feature to the distribution of these northern streams, and is so grandly illustrated in their main type, the Mississippi. It seems to select, by preference, the lower terminations of these expansions, which generally debouch by a narrowed outlet and considerable fall, constituting rapids . . . It is rarely met with on inland lakes which have no outlet.[3]

This section has shown that most of Wisconsin and the northern half of Minnesota bore wild rice so abundantly that the Indian population depended very largely upon it for food. This "wild-rice district," as considered in chapter VI, includes Wisconsin, excepting the southwestern part, and that part of Minnesota lying east of Mississippi river. This boundary is fixed almost arbitrarily, the only reasons being that more accurate statistics of Indian population, and a more precise knowledge of Indian food conditions, were here obtainable than for the territory west of the Mississippi, which consequently is left out of consideration, though it has abundant wild-rice fields.

This view of the habitat within the wild-rice district shows that no other section of the North American continent was so characteristically an Indian paradise, so far as a spontaneous vegetal food is concerned, as was this territory in Wisconsin and Minnesota.

Foreign Habitat

Immediately north of the states of Wisconsin and Minnesota, in Canada, the entire system of waterways, extending from Grand Portage of Lake Superior through the Winnipeg system, produces wild rice abundantly. Still farther north and east there are lakes in which John Long reported the grain one hundred and fifty years

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[1] Warren, History of the Ojibwa, p. 156.

[2] Butler, Tay-cho-pe-rah, in Wisconsin Historical Collections, vol. x (1883–1885), p. 75.

[3] Upham, Catalogue of the Flora of Minnesota, p. 159.

ago. He said that Lake Monontoye "abounds with excellent fish and wild fowl; and oats, rice, and cranberries grow spontaneously in the swamps."[1] Of Red lake (Misqui Sakiegan) Long said, "Fish is caught here in great abundance, and wild rice grows in very great plenty in the swamps."[2] In speaking of Weed lake (Lake Schabeechevan) he further says, "The swamps are full of wild rice and cranberries."[3] In Ontario wild rice grows in immense beds along the shore of Lake Ontario, being very abundant in Quinto bay. It grows also along Lake Erie, and along the shore of Lake Huron, especially on the shore of Georgian bay.[4] It is plentiful also in that triangular section of Ontario roughly bounded by lakes Huron, Erie, and Ontario, and Ottawa river. Special reference has been made to it in the region of Lake Simcoe and Rice lake between Quinto bay and Georgian bay.[5]

Wild rice is reported as growing in New Brunswick and Newfoundland.[6] The seed has also been planted in England, where Sir Joseph Banks introduced it from Canada, in 1790. In 1819 it was still growing at his villa, Spring Grove.[7] It was also planted at Lincolnshire, with the intention of popularizing it as a food for the poor, but it failed.[8] The plant is said to be found in Jamaica, and it is further reported from the eastern part of Siberia[9] and from eastern Russia, where it is called *Zizania latifolia*.[10] These last two references probably refer to the same country. In Japan the plant is very common, extending from the island of Yezo, in the north, to Shikoku and Kiushiu, in the south, its total habitat thus reaching from 31° to 41° north latitude. It also thrives in eastern China and on the island of Formosa.[11] So far as is known the plant is nowhere reported as native in Europe, Africa, Australia, or South America.

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1 Long, Voyages, p. 76.

2 Ibid., p. 81.

3 Ibid., p. 108.

4 Kohl, Travels, vol. II, p. 46, et seq. See also Canniff, History of the Settlement of Upper Canada, pp. 587–588; Newberry, Food and Fiber Plants of the North American Indians, Popular Science Monthly, vol. XXXII, p. 40.

5 Kohl, op. cit., vol. II, p. 46, et seq. See also Flint, History and Geography, vol. II, p. 134; Copway, Life of Kah-ge-ga-gah-bowh, p. 65.

6 Mac Kay, Letter, Halifax, May 1, 1899.

7 Cyclopedia or Universal Dictionary of Arts, Science, and Literature, vol. XXXIX.

8 Smith, Dictionary of Economic Plants, p. 83.

9 Vasey, The Agricultural grasses of the United States, Dept. of Agriculture, Bot. Div., Spec. Bull. 1889, p. 47.

10 Bentham, Notes on Gramineæ, pp. 14–134, in Jour. Linn. Soc., vol. XIX, Botany, 1882, p. 54.

11 Letter of J. Matsumura, Tokyo, Japan, December 16, 1898.

Chapter III

INDIANS[1]

The Ojibwa

In the region of the upper lakes the wild rice producing Indians are of two great linguistic stocks, the Algonquian and the Siouan. Of the Algonquian stock the Ojibwa, Menomini, Sauk, Fox, Ottawa, Potawatomi, Maskotin, and Kickapoo tribes will be considered, while of the Siouan stock, attention will be devoted to the Dakota, Winnebago, and Assiniboin tribes. A small number of refugee Huron and Petun Indians of the Iroquoian stock were within this territory at one time.

When one considers their fierceness, numbers, and extensive habitat, the Ojibwa (usually called Chippewa) and the Dakota (generally designated Sioux) are the most important of all of the Indians within the wild-rice area. These two tribes have been enemies and friends successively from historic times until 1862, when the Dakota were removed from Minnesota.

Even previous to the records of written history, native tradition paints a picture of almost constant struggle between the Ojibwa and Dakota Indians for the conquest and retention of the territory including the rich wild-rice fields. Schoolcraft wrote in 1831:

> A country more valuable to a population having the habits of our northwestern Indians could hardly be conceived of; and it is therefore cause of less surprise that its possession should have been so long an object of contention between the Chippewas and Sioux.[2]

The same author further spoke of this region as follows:

> It has been noted, from the first settlement of Canada, as abounding in the small furred animals, whose skins are valuable in commerce. Its sources of supply to the native tribes have been important. It has, at the same time, had another singular advantage to them from the abundance of the grain called *monomin*, or rice, by the Chippewa Indians, and *Psin* by the Sioux.[3]

Mr W. W. Warren presented many facts pertaining to the subject in his valuable work, History of the Ojibways, Based upon Tradition and Oral Statements.

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[1] Many facts concerning the production and consumption of wild rice by the Indians in the wild-rice district must be considered later in chapter VI, which treats of the general social and economic interpretations. This present chapter seeks only to locate the wild rice producing Indians, giving their migrations and population.

[2] Schoolcraft, Summary Narrative, p. 544.

[3] Schoolcraft, Indian Tribes, vol. I, p. 187.

Indian traditions, such as are recited in the so-called Grand Medicine Society of the Ojibwa, contain much of Indian tribal history. The student will be impressed with the accuracy of Ojibwa traditions, as presented by Mr Warren, when dates are mentioned which authentic written history can confirm.[1] That authority states that, according to their traditions, the Ojibwa dwelt on the Atlantic coast north of St Lawrence river about five hundred years ago. At that time they started westward, stopping for a considerable period on the St Lawrence near the present Montreal, again on Lake Huron, then at Sault Ste Marie, and finally at La Pointe, Wisconsin, and possibly also at Fond du Lac, Lake Superior, as one of their traditions includes this latter as a stopping place.

It is not known what name the Ojibwa bore before they reached Michilimackinac, where, from natural causes, they split into three great sections. One section remained near the point of separation—these are the Ottawa, "Ot-tah-way," or "Traders." The second, the Potawatomi, "Potta-wat-um-ees," or "Those-who-make-or-keep-a-fire," moved up Lake Michigan and for a time kept alive the sacred national fire. The third division, the Ojibwa, or "To-roast-till-puckered-up," stopped at Sault Ste Marie for a long period after the separation. They made war against the Iroquois in the east, whom they called "Nand-o-waig," and against the Sioux [Dakota] in the west, whom they called "Naud-o-wa-se-wug." Nand-o-waig literally means "Like-unto-the adders," and is thus an Ojibwa tribute to the deadly warlike spirit of both these tribes.

During a considerable part of the westward migration of the tribal ancestors of the Ottawa, Potawatomi, and Ojibwa Indians, it is doubtless true that they were driven in that direction by the fierce Iroquois. But since the division of the parent tribe, the Ojibwa, in their continued westward migration, have been mainly fierce aggressors. Some of them remained at Sault Ste Marie and in time became a village. These were the first Ojibwa with whom the French came in contact, and because of the situation of this village the French called all of the Ojibwa Indians "Saulteaux." The remainder of the tribe split again, however, and continued westward. One branch, the Saulteaux, passed north of Lake Superior even to Rainy lake, and formed a lasting peace with the

[1] Mr Warren says that the Ojibwa Indians first became acquainted with the white man about the year 1612 (op. cit., p. 90). Dr Neill has shown from printed records that Stephen Brulé, one of the reckless and enterprising voyageurs under Champlain, appears to have been the first white man who brought to Quebec, about 1618, a description of Lake Superior, as well as a specimen of its copper; and further, Lake Superior is first shown on a map by Champlain in 1632. It is probable that the Ojibwa Indians were the ones with whom Brulé came in contact on Lake Superior at that time (see Neill, in Minn. Hist. Colls., vol. v., pp. 399–405). Again, Warren fixes the date of the treaty between the Ojibwa and the Dakota, after the former had driven the Dakota from the rice lakes of St Croix river, at about the year 1695. Warren's editor calls attention to the fact that La Harpe wrote that Le Sueur in 1695 built a fort on an island in the Mississippi about 200 leagues above Illinois river in order to effect a treaty between the Sauteurs (Ojibwa) and the Sioux (Dakota) (Warren, op. cit., p. 163 and note).

Assiniboin and the Kinisteno or Cree, and from there joined their southern kinsmen against the latter's enemies, the Dakota. The second or southern division, after leaving Sault Ste Marie, pushed westward along the south shore of Lake Superior, stopping temporarily at Grand island, L'Anse, and finally at "Shaug-ah-waum-ik-ong" or Chequamegon bay.

Warren says that it was while the Ojibwa were still at Sault Ste Marie that they and the Dakota first met, as is seen in the name which the latter gave the Ojibwa—"Ra-ra-to-oans," or "The-people-of-the-falls." In all this westward movement south of Lake Superior the Ojibwa were surrounded by the fierce "O-dug-aum-eeg," or "Opposite-side people" (the Fox Indians), and also by the Dakota, who claimed the southern and western sides of the lake. Every foot of ground was valiantly contested, until at last the invaders halted near La Pointe, where they were compelled to seek safety on La Pointe island. It is clear, from Indian tradition, and the evidence seems trustworthy,[1] that it was about three hundred and sixty years previous to 1852, the year in which Warren wrote, that the Ojibwa assembled on La Pointe island. This would be about 1492. There they built a village and cultivated extensive gardens of pumpkins and maize. They also occasionally hunted on the mainland along the headwaters of St Croix river. They lived about a hundred and twenty years on La Pointe island, from which, after a signal victory over a war party from both of their western enemies, the Dakota and the Fox, they gained a lasting foothold on the mainland and spread to the south and west. From early in the seventeenth century they had ascended St Lawrence river with canoe loads of furs for the French. Then they acquired firearms and the primitive man's craving for strong drink, and learned the exchange value of peltries in satisfying their new wants; with a force at once rapid and irresistible they plunged into the land of small lakes to the south and west, where the small furred animals were the most abundant. They destroyed the Fox villages about the headwaters of the St Croix and forced the inhabitants to desert their rice lakes in the midland country between St Croix and Chippewa rivers, the ejected people fleeing to Wisconsin river. The invading Ojibwa also planted a village on an island at the mouth of St Louis river at Fond du Lac. Warren places the date of these inland movements between the years 1612 and 1671. In 1746 the Fox Indians again incurred the hatred of the Ojibwa, who, with the assistance of the French, dislodged them from Wisconsin river and Lake Michigan, and drove them to the Mississippi.

The Dakota of Mdewaka^{n} ("Spirit lake," Mille Lacs), were at peace with the Ojibwa of Fond du Lac, but having treacherously

[1] Warren, op. cit., pp. 89-90.

murdered some of the Ojibwa from that village, they were driven from Mille Lacs by the united Ojibwa tribe. Immediately thereafter the Ojibwa began to force the Dakota from the rice lakes of St Croix river region, which they had long occupied in conjunction with the Fox Indians. In 1695 Le Sueur effected peace between the Ojibwa and the Dakota of the St Croix, who at that time lived near together and even intermarried. The Ojibwa chose Rice lake at the head of Shell river, which is a tributary of the St Croix, as their permanent settlement in the newly acquired territory, and it was still an Ojibwa village in 1852.[1]

Fish are very plentiful in all of the lakes about the sources of the Mississippi. The country also affords birch bark and maple sugar abundantly, and "in many of these lakes, which lie clustered together within an area of several hundred miles, the wild rice grows in large quantities and most luxuriantly, affording the Indian an important staple of subsistence."[2] After the conquest of the Mille Lacs and St Croix region the Ojibwa drove the Dakota from Sandy lake, Aitkin county, Minnesota, and made there a permanent settlement. It was subsequently from this point, as before it was from Chequamegon bay, that the Ojibwa war parties started which eventually drove the Dakota from their favorite homes at Leech, Winnipeg, Cass, and Red lakes, as well as from Gull lake, Crow Wing, and the vicinity of Mille Lacs. The Dakota made their last determined stand upon the islands of Leech lake, but finally withdrew to the edge of the western prairies between the sources of Minnesota river and Red river of the North. By the year 1783 the Ojibwa were occupying Sandy, Leech, and Red lakes, and there was not a Dakota village above the Falls of St Anthony and east of the Mississippi.[3]

The first permanent Ojibwa settlement on Ottawa lake, the site of the present Lac Courte Oreille reservation, was made about the year 1745. From there new villages were at length made at Lac Chetac, Red Cedar lake, Long lake, and "Puk-wa-wanuh on Chippeway river." At about the time that the Fox Indians were driven from Wisconsin river, the Ojibwa began to occupy this latter territory, their chief village being established at "Waus-wag-im-ing" (Torch lake, Lac du Flambeau). From here they spread down the Wisconsin as far as the mouth of Fox river, and toward the east as far as Pelican lake. From these various places, during the last hundred years, they have spread over the remainder of northern Wisconsin and Minnesota, fighting with remnants of the Fox, Dakota, and Winnebago tribes at each advancing step. In the latter part of the eighteenth century the two bands of the Ojibwa—the Lac Courte Oreille and Lac du Flambeau—on the sources of Chippeway and Wisconsin rivers, respectively, numbered about a thousand

[1] A permanent Ojibwa wigwam is illustrated in plate LXVIII, though generally, at that day, permanent as well as temporary wigwams were of birch bark or birch bark and matting, See plates LXVII *b*, LXXIX.

[2] Warren, op. cit., pp. 175–176.

[3] Neill, History of the Ojibwa, p. 450.

souls. They raised large quantities of maize and potatoes; "they also collected each autumn large quantities of wild rice, which abounded in many of their lakes and streams."[1]

The following facts shed light on the importance which the Indian attached to wild rice. Almost every bend of Chippewa and Red Cedar rivers has been the scene of an Indian battle, and each of these streams has borne a name synonymous with "Wild-rice river." Prairie-rice lake ("Mush-ko-da-mun-o-min-e-kan," Prairie lake, Barron county, Wisconsin) has been the scene of several battles between the Ojibwa and the Dakota. It is about 8 miles long and averages less than a quarter of a mile wide. It is shallow, miry-bottomed, and almost entirely covered with wild rice, which is so thick and luxuriant that the Indians have to cut paths through it for their canoes. "From the manner in which they gather the rice, and the quantity which a family generally collects during the harvesting season, this lake alone would supply a body of 2,000 Indians."[2] From the earliest period of their occupation of the Chippewa river country, the most fearless of the Ojibwa came to this lake each fall of the year to collect a portion of the abundant rice crop, notwithstanding its close vicinity to the Dakota villages, and notwithstanding that they lost lives from the sudden attacks of the Dakota almost yearly.[3]

Some of the Ojibwa villages near the wild-rice fields were named "Wild-rice village." In 1852 Warren[4] said that the Ojibwa living on "Rice" lakes of the St Croix were called "Mun-o-min-ik-a-sheenh-ug, or Rice-makers." In 1831, Schoolcraft, in naming the Ojibwa bands, mentioned the "Folle Avoine country" as including Lac du Flambeau, Ottowa lake, Yellow river, "Nama Kowagun" of St Croix river, and Snake river.[5] Indeed, the French called the Indians of all this section of country—the river sources of northern Wisconsin—the "Fols Avoin Sauteurs."[6] Arrowsmith's map (London, 1796; additions, 1802) shows the Ojibwa occupying the territory both north and south of Lake Superior, and shows Burntwood river (Bois Brulé) as the "passage into the country of the Wild Rice Indians." It leads to the headwaters of St Croix river, half-way down the course of which is a "Chippeway village called the Rice people."

About 10,000 Ojibwa Indians had access to wild rice from the time they drove the Fox Indians out of the wild-rice fields until, say, the year 1825, or in round numbers two hundred years, and this is about the present Ojibwa population in the United States who use wild rice.[7]

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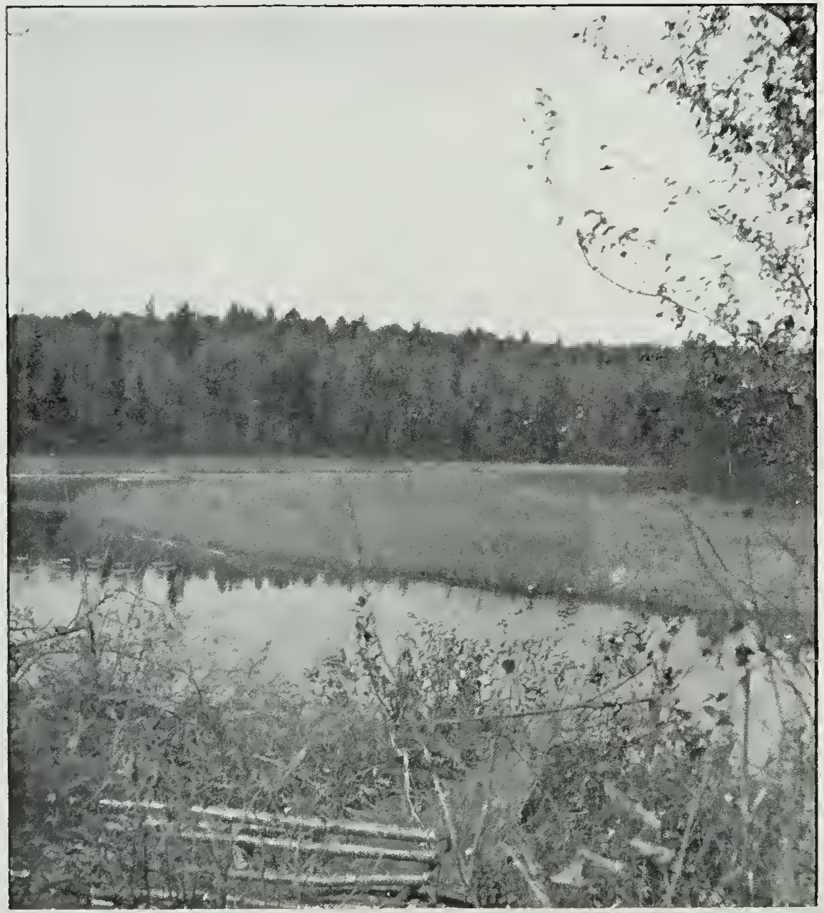
[1] Warren, op. cit., p. 299.
[2] Ibid., p. 309.
[3] Ibid., pp. 309–310.
[4] Ibid., p. 38.
[5] Schoolcraft, Narrative, appendix, p. 576.
[6] Coues, Pike, vol. I, pp. 342–343.
[7] The portable wigwams in which these Indians visit the rice fields are illustrated in plates LXVII *b*, LXXIX.



A, WILD-RICE BED IN LAC COURTE OREILLE RIVER

B, OJIBWA BIRCH-BARK AND MATTING WIGWAM AT THE WILD-RICE FIELD

The Dakota

Ethnologists have shown that the Indian tribes of the Siouan linguistic stock at one time occupied the Piedmont and coastwise areas between the Appalachian range and the Atlantic in the present states of Virginia, North Carolina, and South Carolina.[1] Allen[2] has proved that the bison, prior to the year 1800, had crossed the Appalachians from the west and occupied the Piedmont area, entering this region probably by the way of Cumberland gap. W J McGee[3] puts these two facts together, and suggests that the bison led the ancestors of the Dakota, one of the Siouan-speaking tribes, from the Piedmont into the western prairies, where history found them. Hale[4] suggests that the valley of Ohio river and of Big Sandy river, which flows into the Ohio and whose headwaters almost interlace those of the southerly flowing Cape Fear river, was the thoroughfare of these Indians and the bison. Further than this, Allen points out on the map accompanying his memoir that prior to 1800 bison had occupied the western part of Wisconsin as far north as the highlands, and all of Minnesota except the northeastern portion. Thus they could easily have led the Siouan stock through Cumberland gap, the thoroughfare suggested by Hale, across the best pasture lands of America, the blue grass of Kentucky and the prairies of Indiana and Illinois, into the territory under consideration.

It is believed, however, that the Dakota were not much given to buffalo hunting until they came into the prairie region west of the Mississippi river, where they became distinctly a buffalo-hunting people. Mr James Mooney suggested to the writer, after this memoir was written, that the Siouan ancestors were literally pinched out of their home in the east. The Iroquoian stock on the north and the Algonquian on the south of them drew in like the approaching sides of a triangle, and they were obliged to flee westward or perish.

It must further be noted that the Dakota, or that division of the Siouan stock which opposed the westward migration of the Ojibwa, were more of the nature of plains Indians than of river Indians. None of the early travelers, including the Jesuit fathers, speak of them as having homes farther east than St Croix river. They all speak of them as settled west of Lake Superior. To be sure the Dakota roamed over all of Wisconsin, even to Sault Ste Marie and to Green bay; and as late as 1696 they attacked the Indians in Michigan around the southern end of Lake Michigan, but their instincts were clearly those of nomads. With the exception of the Siouan-speaking Winnebago

[1] Horatio Hale, The Tutelo Tribe and Language, Proc. Am. Philos. Soc., vol. XXI, 1883–84; see also James Mooney, Siouan Tribes of the East, bulletin of the Bureau of Ethnology, 1894, and Horatio Hale, Indian Migrations, Am. Antiquarian, January and April, 1883.

[2] The American Bisons Living and Extinct.

[3] The Sioux Indians; A Preliminary Sketch, Fifteenth Ann. Rept. Bu. Amer. Ethnol., p. 173.

[4] Indian Migrations, op. cit., p. 3.

Indians, part of the Mandan, and a few of the Dakota, the entire western Siouan stock seems to have clung to the hunter life of the plains.

A straight line drawn from the foot of Lake Michigan to the foot of Lake Superior (Fond du Lac) marks the early eastern boundary of the bison country in the wild-rice district. Near Madison, Wisconsin, this boundary line bends slightly west of a straight line, while farther north it bends to the east so as virtually to cover the headwaters of Chippewa and St Croix rivers. It is thus seen that the Dakota were on the border line. They were acquiring a taste for wild rice, though they had not cultivated the soil in any way, and they still kept up their fondness for the bison with which they were surrounded when the Ojibwa began to force them westward south of La Pointe island. Though the Dakota fought doggedly, the Ojibwa obtained firearms at an earlier period and in greater numbers than they, and in the end were successful. Previous to the year 1776 Perrot built a fort at Lake Pepin, and Neill[1] said of the French at this fort: "Through their influence the Dakota began to be led away from the rice grounds of the Mille Lacs region."

Another cause aided the Ojibwa toward the latter end of this struggle. As soon as the Dakota acquired horses they turned more readily to their employment of hunting the bison. They came in possession of horses near the opening of the nineteenth century. About the year 1766 Carver said that the Dakota method of hunting the bison was to form a circle around a herd and then set the grass on fire. Few of the animals escaped.[2] Evidently the Dakota were then horseless. Again he said of the Indians still farther south and west: "Having great plenty of horfes, they always attack their enemy on horfeback."[3] And later, "The Naudoweffies [Dakota], who had been at war with this people, informed me, that unlefs they found moraffes or thickets to which to retire, they were fure of being cut off: to prevent this they always took care wherever they made an onfet, to do it near fuch [places] as were inpaffable for cavalry." Lewis and Clarke wrote in 1804–1806 that dogs were still the beasts of burden used by the Dakota. Their "lodges may be taken to pieces, packed up, and carried with the nation wherever they go, by dogs which bear great burdens."[4] Later they wrote that the Dakota frequently made incursions among the Mandan Indians to steal horses,[5] and that "the horses of the Mandans are so often stolen by the Sioux, Ricaras, and Assiniboins, that the invariable rule now is to put the horses every night into the same lodge with the family."[6] According to Mallery the Dakota winter counts show that the Dakota first saw and stole horses wearing shoes in the winter of 1802–1803.

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1 Neill, Indian Trade, in Annals of the Minn. Hist. Soc., 1852, p. 32.

2 Carver, Travels in 1766, 1777, 1778, p. 287.

3 Ibid., p. 294.

4 Coues, Lewis and Clarke, p. 140.

5 Ibid., p. 175.

6 Ibid., p. 233.

In the winter of 1811–1812 they caught many wild horses south of Platte river, and in the following winter they used riatas to catch wild horses.[1]

So, while during the early incursions of the Ojibwa into the wild-rice fields of the Dakota these fields were worth defending, yet they became less so when the horse came to carry the bison-loving Dakota into the great pasture lands of the western prairies.

However, wild rice played no small part in the household economy of the Dakota Indians, those east of the Mississippi doubtless using it more than the others. A French author, probably of the first quarter of the seventeenth century, wrote that there were five village districts of these Indians. "The Ouatabatonha (River Sioux) live by the St Croix river or on the Wildrice lake, which is below and 15 leagues from the Riviere au Serpent . . . The Menesouhakatoha (or lake Sioux) . . . The Natatoha (or prairie Sioux) . . . The Hictoha (or hunting Sioux) . . . The Titoha (or prairie Sioux)." The five villages numbered 1,200 men, or about 6,000 or 7,000 souls. These were the only Dakota with whom there was any considerable commerce at the time. Others farther west would be little known, but the five villages of 6,000 or 7,000 souls were doubtless about the only Dakota who had access to wild rice. This number must again be reduced, for the Titoha village was situated 50 leagues west of St Anthony falls, hence probably did not use the grain, while it is recorded that the people of other four villages did not cultivate the soil, but were roving about and lived on game, fish, and wild rice.[2] This leaves some 5,000 or 6,000 of these Indians who used wild rice.

Previous to this Perrot said that they occupied a country of nothing but lakes and marshes filled with wild rice. It lay for 50 or more leagues square (19,000 or 20,000 square miles) on both sides of the Mississippi:

Il est à remarquer que le pays où ils [the Dakota] sont n'est autre chose que lacs et marests, remplis de folles avoines, séparés les uns des autres par petites langues de terre qui n'ont tout au plus d'un lac à l'autre que trente à quarante pas, et d'autres cinq à six ou un peu plus. Ces lacs ou marests contiennent cinquante lieues et davantage en carré, et ne sont séparés par aucune rivière que par celle de la Loüisianne (le Mississippi), qui a son lit dans le milieu, où une partie de leurs eaux vient se dégorger. D'autres tombent dans la rivière de Saint Croix, qui est située à leur égard au nord-est, et les range de près. Enfin les autres marests et lacs situez à l'oüest de la rivière de Saint Pierre s'y vont jetter pareillement; si bien que les Scioux sont inaccessibles dans un pays si marécageux, et ne peuvent y estre détruits que par des ennemis ayant des cannots comme eux pour les poursuivre; parceque dans ces endroits il n'y a que cinq ou six familles ensemble, que forment comme un gros, ou une espèce de petit village, et touts les autres sont de mesme éloignez à une certaine distance, afin d'estre à portée de se pouvoir prester la main à la première alarme. Si quelqu'une de ces petites bourgades est attaquée, l'ennemy n'en peut deffaire que

[1] Pictography of the N. Am. Indians, Fourth Ann. Rept. Bur. Eth., p. 89 et seq.
[2] Neill, Memoir of the Sioux, p. 235.

très peu, parceque tous les voysins se trouvent assemblez tout d'un coup, et donnent un prompt secours où il est besoin. La méthode qu'ils ont pour naviguer dans ces sortes de lacs est de couper devant leurs semences, avec leurs cannots, et, les portant de lac en lac, ils obligent l'ennemy qui veut füir à tourner autour; qui vont tousjours d'un lac à un autre, jusqu'à ce qu'ils les ayent tous passez, et qu'ils soient arrivez à la grande terre.[1]

In 1659 Radisson wrote of the Dakota:

Some 2 moons after there came 8 ambaffadors from the nation of Nadoneferonons [Dakota] that we will call now the Nation of the beefe. Thofe men each had 2 wives, loaded of Oats [wild rice], corne that growes in that countrey, of a fmall quantity of Indian Corne, w[th] other grains, & it was to prefent to us, w[ch] we received as a great favour & token of friendfhippe.[2]

In 1671 we read that "they content themselves with a kind of marsh rye, that we call folle avoine, which the prairies supply spontaneously."[3]

In the latter part of the seventeenth century Le Sueur wrote much regarding the use of wild rice by the Dakota. Several references to his remarks will be made later; one, however, is now given. Le Sueur had built a fort on the Upper Mississippi in order to effect a treaty between the Ojibwa and Dakota, and on December 12, which would be after the harvest season for wild rice, three Mendeouacanton (Mdewaka^{n}to^{n}wa^{n}) chiefs came to tell him that the next summer, after having built canoes and gathered their wild rice, they would move near the French. La Harpe wrote, "et promirent que l'été suivant, après avoir construit des canots et fait leur récolte de folle avoine, ils viendraient s'établir auprès des Français."[4]

Early in the nineteenth century Pike recorded that—

The Minowa Kantongs are the only band of Sioux who use canoes, and by far the most civilized, being the only ones who ever built log huts, or cultivated any species of vegetables, and among those only a very small quantity of corn and beans; for, although I was with them in September and October, I never saw one kettle of either, they always using wild oats [wild rice] for bread. This production nature has furnished to all the most uncultivated nations of the N. W. continent, who may gather in autumn a sufficiency which, when added to the productions of the chase and the net, insures them a subsistence through all the seasons of the year.[5]

This band are reported the bravest of all the Sioux, and have for years been opposed to the Fols Avoin Sauteurs, who are reported the bravest of all the numerous bands of Chippeways.[6]

They resided from Prairie du Chien for 35 miles up Minnesota river. The Kahra, a Dakota band, are called by Coues the "Wild Rice Sissetons."[7] They extended from White Rock to Big Stone, or Inyantonka lake, on Minnesota river.

A little later Schoolcraft presented the following facts:

Even during the first part of the nineteenth century the Dakota, who constituted the tribe of lake people, the Mendewakantons, were united in three villages. The

[1] Mémoire sur les Mœurs, Coustumes et Relligion des Sauvages de l'Amérique Septentrionale, par Nicolas Perrot, Leipzig and Paris, 1864, pp. 88–89.

[2] Radisson, Voyages, p. 207.

[3] Relations des Jésuites, 1671, Quebec, 1858, p. 39

[4] La Harpe, Journal Historique, p. 68.

[5] Coues, Pike, vol. I, p. 344.

[6] Ibid., pp. 242–243.

[7] Ibid., p. 349, note.

first was east of the Mississippi and about 4 miles from the Minnesota river. The second was on the Mississippi river. The third was on both sides of the Minnesota, about 6 miles from its mouth. Lying near the intersection of the roads between these three villages were the low grounds and marshes of sugar maple and wild rice, and here the villagers assembled to make sugar in the spring and to gather rice in the autumn.[1]

The fierce struggle of the Dakota with the Ojibwa at the rice fields is a measure of the value they put upon them. Among them, as among the Ojibwa, there were rice villages. La Harpe mentions three such, as follow: "Les Psioumanitons, village des chercheurs de folle avoine" (village of wild rice gatherers), "les Psinchatons, village de la folle avoine rouge" (village of the red wild rice), and "les Psinontanhinhintons, village de la grande folle avoine" (the great wild-rice village).[2] He mentions nine Dakota villages west and seven east of the Mississippi. It has been asserted that from the year 1800 until 1851, when they were removed to Redwood reservation in western Minnesota, the Dakota east of the Mississippi, to the number of 2,000, used wild rice largely. "Even after that a considerable number would visit the rice fields every fall to gather what they could 'til 1862, when the Minnesota massacre occurred, and they were removed to the Minnesota river. A few stragglers remaining in Minnesota still gather some."[3] The above letter does not speak of rice gathering by the western Dakota, but two of the wild-rice villages mentioned by La Harpe were west of the Mississippi, and, as has been shown and will be shown later from the testimony of maps, Minnesota river had immense wild-rice fields, while a few bodies of water west of the Mississippi bear the Dakota name for wild rice.

Considering all the data presented, it is probable that the estimate of 2,000 wild rice producing Dakota Indians is too conservative for the earlier part of the nineteenth century; and it is believed that between 5,000 and 7,000 Dakota Indians used wild rice at the time the Ojibwa were nominally in control of the territory east of the Mississippi. None of the Dakota Indians on reservations have access to wild rice at the present time.

The Menomini

From the point of view of the present memoir the Menomini Indians are unique. From the year 1634 they have consumed wild rice in large quantities. Unlike other Indians who, for short periods, have been named because of their intimate relations with the grain, the Menomini have always been known, so far as Indian tradition and authentic history are concerned, as the "Wild-rice Indians" par excellence.

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[1] Schoolcraft, Indian Tribes, vol. II, p. 97.

[2] La Harpe, Journal Historique, pp. 69, 70.

[3] Letter of Reverend John P. Williamson, Greenwood, South Dakota, January 21, 1899. Mr Williamson and his father before him have been lifelong missionaries to the Dakota Indians.

In 1634, when Sieur Jean Nicollet first visited Green bay, he found there a tribe of Indians lighter in complexion than their neighbors and remarkably well formed. They subsisted largely on wild rice, called "in their language *manoma*—from which they took their name; their own term being Omanominewak (Wild rice men)."[1] According to Hoffman the word "Menomini" is derived from *Omä'nomïnĕ'ŭ* (*mäno'me*, rice, and *inä'neŭ* or *inä'ni*, man). This is the name of the tribe in their own language, the Algonquian, though they pronounce it more as though it were spelled "Menomoni." The French named them "Folle Avoine," "Wild, Mad, or False Oat." From the above Indian and French terms and their English translations Hoffman records eighty-four synonyms by which these Indians have been known in written history.[2] Inasmuch as these synonyms are accessible in his monograph, they are not reproduced here, but a few synonyms supplementary to his list are presented:

Fallisavoines. Wisconsin Historical Collections, vol. xii, p. 78.

Faulsavoins. Ibid., vol. xiii, p. 443.

Follavoine. Ibid., vol. xi, p. 265.

Folle avoini. Buchanan, James, Sketches of the History, Manners, and Customs of the North American Indians, vol. v, p. 139 (New York, 1824).

Followens. Long, Voyages, p. 146.

Mahnomoneeg. Tanner, Narrative, p. 315.

Malhoinmi. Carte Particuliere du Fleuve Saint Louis . . . avec les noms des Sauvages du pais, des Marchandises, 1750–60.

Malhonmines. Radisson, Voyages, p. 201.

Malomine. De Vaugondy, map, Amerique Septentrionale, 1750.

Manominis. Wisconsin Historical Collections, vol. xii, p. 79.

Monomonis. Map, The Upper Territories of the United States, in Carey's General Atlas, Phila., 1814.

Munominees. Atwater, Indians of the Northwest, p. 81.

Omanominewak. Krautbauer in Am. Cath. Hist. Researches, Oct., 1887, p. 152.

Wild Rice Indians. Wisconsin Historical Collections, vol. i, p. 52.

Radisson said of the Menomini late in the fifth decade of the seventeenth century: "They weare of a nation called Malhonmines; that is, the nation of Oats, graine y^t is much in y^t countrey."[3] Charlevoix, in 1721, wrote of an island on the western side of Green bay, "upon which is the Village of the Malhomines, which the French call folles Avoines, (wild Oats), probably becaufe they make their common Food of this Grain."[4] From that time until the present there is frequent evidence that these Indians depended greatly upon wild rice. A few instances will be cited. Major Irwin wrote of them in 1820: "The Canadians designate them Folls-avoine . . . wild oats, or rice. This is one of the principal articles on which the Indians subsist in this quarter. It is to be found in great abundance, in the fall of the year . . . It is believed that enough of it could be gathered in the fall.

[1] Krautbauer, in American Catholic Historical Researches, Oct., 1887, p 152.

[2] Hoffman, The Menomini Indians, Fourteenth Annual Report of the Bureau of Ethnology, part 1, pp. 12–14.

[3] Radisson, Voyages, p. 201.

[4] Charlevoix, Voyage to Canada, letter xix, p. 202.

PERMANENT ASH-BARK WIGWAM OF THE WILD RICE GATHERING OJIBWA

to support several thousand Indians, for one year."[1] He continued: "In the spring they subsist on sugar and fish; in the summer on fish and game; in the fall, on wild rice, and corn, and in the winter on fish and game. Those who are provident, have some rice during the winter."[2] In 1829 wild rice furnished them abundant subsistence.[3] Governor Dodge said of them in 1837–38, they "raise corn on the Oconte, Menominee, and Fox rivers, in small quantities, but depend on the chase, fishing, fowling, and gathering of wild rice for subsistence."[4] Exactly similar reports were made for the years 1844 and 1845.[5]

These Indians are of the Algonquian linguistic stock, and for over two hundred and sixty years have been known to live in Wisconsin near Green bay. It is not known that they came westward with their kinsmen, the Ojibwa, Ottawa, and Potawatomi, but it seems probable that they preceded these others into the wild-rice district. Their habitat has shifted from the Menominee river on the north, between the upper peninsula of Michigan and Wisconsin, where their traditions fix the origin of the tribe, back and forth over the territory west of Green bay as far south as Fox river and Lake Winnebago. In 1852 they moved to their present reservation of ten townships, some 360 square miles, or about 230,000 acres, located in east-central Wisconsin. In August of the following year Oshkosh, their head chief, asked the agency superintendent to permit the tribe to go back to their old rice fields to gather rice.[6] Most of their rice is gathered at present in Lake Shawano, which lies about 8 miles south of the reservation.

The following statistics of Menomini population have been gathered:

Year	Warriors	Women	Children	Total	Authority
1718	80–100	....	....	....	Doc. Coll. Hist. New York, vol. IX, Albany, 1855, p. 889.
1761	150	....	....	....	Wis. Hist. Colls., vol. I, 1854, p. 32.
1820	600	900	2,400	3,900	Morse, Report, New Haven, 1822, app., p. 51.
1842	....	....	....	2,464	Indian Affairs Report, 1843.
1850	....	....	....	500	
1856	....	....	....	1,930	
1857	358	425	914	1,697	
1863	....	....	....	1,724	Indian Affairs Report, 1863, p. 502.
1872	....	....	....	1,362	Indian Affairs Report, 1872, p. 384.
1882	....	....	....	1,500	Indian Affairs Report, 1882, p. 344.
1884	....	....	....	1,400	Indian Affairs Report, 1884, p. 300.
1890	....	....	....	1,311	Indian Affairs Report, 1890, p. 462.
1892	....	....	....	1,335	Indian Affairs Report, 1892, p. 798.
1898	....	....	....	1,375	Indian Affairs Report, 1898, p. 612.

[1] Morse, Report, app., p. 47. Dr Morse (ibid., app., pp. 51, 52) also reports communications from Messrs. John Lawe, Jas. Porlier, Peter, Augustin, and Louis Grignon, and Laurent Fily to the same effect. These gentlemen were traders at Green bay and vicinity for half a century.

[2] Ibid., app., p. 48.

[3] House of Reps., War Dept., 20th Cong., 2d sess., House of Reps. Doc. No. 117, Indian Affairs; see also Schoolcraft, Indian Tribes, vol. III, pp. 591, 607, for the years 1829 and 1832.

[4] Indian Affairs Report, 1837–38, p. 16.

[5] Op. cit., 1844–45, p. 131, and op. cit., 1845, p. 494.

[6] Op. cit., 1853, p. 52.

It is believed that an average of 1,500 souls is a safe estimate for the number of this tribe during the last two hundred and fifty years.

The Sauk and Fox

The tribes of the Sauk and Fox Indians have been closely associated for a long time. They are Algonquian, and therefore kindred to the Ojibwa and Menomini. It is believed that they, like the Menomini, reached the wild-rice district before the Ojibwa, and that they and all their kinsmen were at one time driven westward by the Iroquois. These latter Indians were so fierce that the Algonquians said of them, "These are not men; these are wolves."

The Sauk have been called O-saug-eeg, Ousakis, Saukies, Sakis, Sacs, or "Those who live at the entry." Warren said that they were called O-dish-quag-um-eeg, or "Last-water people."[1] Armstrong wrote of the Osaukies, or "Men from the white earth or clay," that they came from Canada by way of Michigan, stopping for a short time at Saginaw (Sauganau), which was named after them. They soon came to Wisconsin and formed a lasting alliance with the Fox Indians.[2]

Warren called the Fox Indians O-dug-am-eeg, or "Opposite-side people," and says that they were driven westward by the Iroquois and settled southwest of Green bay, Wisconsin, where they were allies of the Sauk Indians. Armstrong spoke of them as the "Men from the red earth."[3] The French called the Fox Indians "des Renards," and it is through the French that the English name is derived. On a map of 1672, and also on Marquette's map of 1673, they are termed "8TAGAMI," and are located on the present Fox river, between Green bay and Lake Winnebago. It has been noticed that these Indians were in villages in the wild-rice fields of St Croix and Chippeway rivers, and that later, after being dislodged by the Ojibwa, they resided on Wisconsin river. That they were producers of wild rice is unquestioned, but it is regretted that so little is known of them during the period when they must have depended largely upon the grain.

The Sauk and Fox tribes united and migrated southwestward early in the eighteenth century. On good authority it was claimed in 1822 that more than a century previous, both of these tribes, who then inhabited the country on Green bay and Fox river, were conquered and driven away by the Menomini, aided by the Ottawa and Ojibwa; and the Menomini title to the territory is admitted to be good by these other four tribes; that is, the Sauk, Fox, Ottawa, and Ojibwa.[4]

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[1] Warren, History of the Ojibways, p. 32.
[2] Armstrong, The Sauks and the Black Hawk War, p. 9.
[3] Armstrong, op. cit., p. 11.
[4] Morse, Report, app., p. 57.

Carver said that there was a Sauk town on the Ouisconsin [Wisconsin] river near the portage to the Fox river where "they raife great quantities of Indian corn, beans, melons, &c. fo that this place is efteemed the beft market for traders to furnifh themfelves with provifions, of any within eight hundred miles of it."[1] It was about the year 1730 that "Sauk-e-nug," the Sauk capital, was built on Rock river some 3 miles south of Rock Island, Illinois. In the year 1804 the Sauk and Fox together ceded southern Wisconsin, or such land as lay east of the Mississippi and as far south as "the mouth of the Ouisconsing river, and up the same to a point which shall be thirty-six miles in a direct line from the mouth of the said river; then in a direct line to the point where Fox river (a branch of the Illinois) leaves the small lake called Sakaegan; thence down the Fox river to the Illinois river, and down the same to the Mississippi." In 1825 the Sauk and Fox relinquished all claim to territory east of the Mississippi and north of Iowa river.

In 1826 it was written of the Sauk that "they don't make use of wild rice, because they have none in their country except when they procure some from the Wenebagoes or Menominie Indians."[2] It is probable that neither of these tribes used wild rice extensively after about the middle of the eighteenth century, when the Fox Indians were driven from their Wisconsin river retreat.

Each of these two tribes numbered probably about 1,500 or 2,000 souls during the period when they produced wild rice. In 1823 Beltrami said that there were four Fox villages along Wisconsin river, with a total population of 1,600.[3] Pike reported in 1806 that in the three Sauk villages there were 700 warriors, 750 women, 1,400 children, and probably a total number of 2,850 souls. Of the Fox Indians he said there were also three villages, and 400 warriors, 500 women, 850 children, a total, probably, of 1,750.[4]

The Winnebago

The Winnebago Indians belong to the Siouan linguistic stock. They were the rear-guard of their kinsmen, the Dakota, for, while the latter, in their movement westward, passed on to the headwaters of the Mississippi and its large tributaries, the Winnebago halted near Lake Michigan. They long occupied a strip of territory lying due east of the Mississippi to the foot of Green bay.

Schoolcraft says the Algonquian called the Puants (Winnebago) "Wee-ni-bee-gog," from the Algonquian *weenud* (turbid or foul), and

[1] Carver, Travels, p. 47.

[2] Account of the Manners and Customs of the Sauk Indians (manuscript), 1826, by Thomas Forsyth (in Wisconsin Historical Society's manuscript collection), pp. 39–40.

[3] Beltrami, Pilgrimage, vol. II, p. 169.

[4] Pike, Expeditions, table F, to face p. 66, app., part 1.

nibeeg (the plural form for water).[1] Again he says that the Winnebago call themselves "Hochungara," or Trout nation, and "Horoji," or Fisheaters.[2] Hoffman presents a Menomini legend of the origin of the name.[3] While Mä'näbŭsh, a mystic personage who instructed mankind in the mysteries of the Mitä'wit, or medicine-society, was lying asleep, some Indians came along and stole all of his roasting birds. He awoke in time to see some very dirty and poorly dressed Indians escaping in their canoes. "Then he called to them and railed them, calling them 'Winnibē'go! Winnibē'go!' And by this term the Menomini have ever since designated their thievish neighbors."

They were at Green bay when Nicollet came there in 1634, living in the wild-rice fields at peace with their Algonquian neighbors, the Menomini, Sauk, Fox, Maskotin, Ottawa, Ojibwa, Potawatomi, and Kickapoo. Schoolcraft says that their earliest traditions place them at Red banks, on the eastern shore of Green bay. There is no doubt, however, that they came into this territory with their Dakota kinsmen, and through preference exchanged the habitat of the prairies for the forests, lakes, and rivers. Lake Winnebago and Winnebago county, Wisconsin, mark their old habitat; in 1658 they were called "Ouinipegouek," and occupied this territory.[4] It is impossible to locate with accuracy any of these early Wisconsin and Minnesota tribes, as their possessions, or claims to possessions, greatly overlapped, and opportunities for correct map-making of the Northwest in the early days of its settlement were far from the best.

The Winnebago have been producers of large quantities of wild rice; in fact it has been, and still is, a staple food with many of them. These Indians ceded their Wisconsin lands, and many of them took a reservation in Minnesota in 1859;[5] but they gradually returned, and in 1897 there were 1,447 of them scattered along Black river and its vicinity in Wisconsin. These are the only Winnebago now in the wild-rice district. Of the numerous Indians of this tribe near the Tomah Indian school in Monroe county, Wisconsin, the school superintendent, under date of August 25, 1898, wrote: "The Winnebago Indians here are nearly all full-bloods, and they are about as far from civilization as they were fifty years ago."[6] The Winnebago in a winter village near Elroy, Juneau county, Wisconsin, in the winter of 1898–99, said that they now gather annually large quantities of wild rice in the sloughs of the Mississippi at La Crosse, Wisconsin, and also on the Iowa side of the stream.

The following estimates of Winnebago population have been made.

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[1] Schoolcraft, Indian Tribes, vol. III, p. 277.

[2] Ibid., vol. I, p. 277.

[3] Hoffman, The Menomini Indians, op. cit., p. 205.

[4] Relations des Jésuites, 1658, p. 21.

[5] See C. C. Royce, Indian Land Cessions in the United States, in the Eighteenth Annual Report of the Bureau of American Ethnology, part 2.

[6] Indian Affairs Report, 1898, p. 399.

PORTABLE BIRCH-BARK AND RUSH-MATTING WIGWAM OF THE WILD RICE GATHERING OJIBWA

Pike reported that in 1806 there were 450 warriors, 500 women, and 1,000 children—a total population of 1,950 in the seven Winnebago villages.[1] In 1812 it was said that there were 700 warriors, 1,000 women, and 1,800 children, or a total of 2,800, while in 1820 there were 900 warriors, 1,300 women, and 3,600 children, a total of 5,800.[2] Probably 2,000 souls is a very conservative estimate of the number of Indians of this tribe who used wild rice during the period with which this memoir deals.

The Potawatomi

It will be remembered that the Potawatomi (Potewa'tmik) are members of the great Algonquian stock, which comprised also the Ojibwa and Ottawa, and which split into three sections at Sault Ste Marie. The present Indians, the "Potta-wat-um-ees," or "Those-who-make-or-keep-a-fire," came southward along the west shore of Green bay and Lake Michigan after the separation alluded to. In 1658 they were reported to be the nearest tribe to the settlement of St Michel near the head of Green bay.[3] They were then called Oupouteonatamik, and numbered 700 men, or 3,000 souls, including 100 of the Petun or Tobacco tribe. Marquette's map of 1673 places the Pstestami (Potawatomi) between Green bay and Lake Michigan. They undoubtedly consumed wild rice at this time, were noted as traders, and were the middlemen between the French and Indians farther inland. Their trading instinct doubtless in large measure explains their departure, for when the French settled at Detroit, some of the Potawatomi followed them there; others stopped at St Joseph river, Michigan, where they produced wild rice (to which numerous references will later be made); still others stopped at Chicago, where they used wild rice, as will also be shown.

Though none of this tribe resides on a reservation in the wild-rice district, yet in 1883 it was said that 280 of them were nomads in Wisconsin, and in 1897 the same estimate of population was made. Doubtless 2,000 or 2,500 of these Indians consumed wild rice at one time.

The Maskotin

In 1658 Père Gabriel Druillettes spoke of the "Makoutensak," the Maskotin, as being the third "nation" west of St Michel at Green bay. A map of 1672 places the "Mascoutens ou Nation du Feu" along the southwest side of Lake Winnebago. On Marquette's map of 1673 the Maskstens are on Fox river above Lake Winnebago. In 1718 the "Feu" were at Chicagou (Chicago), according to a French map.[4] Hennepin's map of 1687 places the Mascoutens, or Nation du Feu, south of the mouth of Fox river. According to others they

[1] Pike, op. cit.

[2] Morse, Report, app., p. 59.

[3] Relations des Jésuites, 1658, p. 21.

[4] Carte de la Louisiane et du Cours du Mississipi.

were south of Green bay in 1736 with 80 warriors, and in 1764 Hutchins reports them still there, but with 500 people. A map of the middle of the eighteenth century locates them south of Wisconsin river.[1] They then vanished from history. It is sometimes maintained that they allied themselves with the Kickapoo and disappeared among them. Schoolcraft says that the Ojibwa and Ottawa drove them southward as they invaded Wisconsin,[2] and that among the traditions of the Algonquian tribes which inhabit the shores of the upper lakes is one that they drove to the south, into the present area of Wisconsin and Illinois, two unknown tribes whose names are "Miscotins" and "Assigunaigs."[3]

In 1671 Father Allouez quotes a "master of a Maskotin feast" as saying "they [the Dakota] have eaten me to the bones, and have not left me a single one of my family in life." In Allouez' words, "il sembloit que ce fust un festin pour combattre, et non pas pour manger . . . Vous avez entendu parler des peuples qu'on appelle Nadoüessi; ils m'ont mangé jusqu'aux os, et ne m'ont pas laissé un seul de ma famille en vie."[4] Thus at that early date the Maskotin were sorely pressed by a fierce and powerful enemy, but it can scarcely be doubted that these Indians, in considerable numbers, occupied the wild-rice region of Wisconsin prior to its occupancy by the Sauk, Fox, and Dakota Indians, as these latter are known to have occupied it before they were driven out by the Menomini and Ojibwa.[5]

The Assiniboin

The "Assinipoualaks" (Assiniboin) or "Warriors of the rocks," are a Siouan tribe which, perhaps in the sixteenth century, after quarreling with their kinsmen, the Dakota, sought refuge among the *assin* or rocks of the Lake of the Woods. Prof. W J McGee says they separated from the Yanktonai Sioux.[6] It will be remembered that the division of the Ojibwa which went westward along the northern shore of Lake Superior found the Assiniboin and formed a lasting peace with them. According to Warren this would have been in the latter part of the fifteenth century; and a letter which appears to have been written at Fort Bourbon on Hudson bay about 1695 says that the Assiniboin separated from the Dakota a long time ago. It reads: "On prétend même que ces Assiniboëls sont une Nation Sciouse, qui s'en est séparée il y a long-temps."[7] It is therefore believed that the

[1] Map of America, John Bowles & Son, London [1740-1750].

[2] Schoolcraft, Indian Tribes, vol. VI, p. 203.

[3] Ibid., vol. I, p. 305.

[4] Relations des Jésuites, 1671, p. 46.

[5] Mr James Mooney, in a recent conversation, advanced the plausible theory, that this tribe was a Potawatomi people, called by the recognized Potawatomi bands Mûshkoden'sûk or (Little) Prairie people. They are now on a reservation in Kansas.

[6] McGee, The Siouan Indians, Fifteenth Annual Report of the Bureau of Ethnology, p. 190.

[7] Lettres Édifiantes, Paris, 1781, vol. VI, p. 30.

Assiniboin separated from their kinsmen as early as the sixteenth century.

Marquette said, in 1670, "The Assinipouars, who have about the same language as the Nadouessi [Sioux, Dakota], are westward from the Mission of the Holy Ghost [at La Pointe, Wisconsin], at a lake fifteen or twenty days' journey distant, where they gather wild rice and where the fishing is very good."[1] Perrot writes of them: "The Chiripinons, or Assiniboulas, sow wild rice in their marshes, which they afterward gather; but they can transport it home only during the period of navigation."[2]

The Kickapoo, Ottawa, and Huron

Besides the Indians previously considered in this chapter, there were several thousand Kickapoo, Ottawa, Huron, and other Indians who lived among them in the wild-rice district.

According to maps of the years 1718, 1740–1750, and 1755, the "Outaouacs" (Ottawa) were a short distance south of Lake Superior. Their numbers at the time are not known.

Radisson and Groseilliers claim to have made, a year or two prior to 1660, a canoe voyage up Lake Superior as far as Chequamegon bay, and from there to have visited a village of refugee Huron Indians living on a lake whose headwaters drained into Chippeway river. Perrot gives their number as 100. About 1660 they went to the Noquet islands at the mouth of Green bay. They moved two or three times more in the northwest, and finally went to Detroit. They were in Wisconsin probably from about 1652 to 1670.[3]

Before 1716 the Kickapoo were reported on the west side of Green bay on the present Fox river.[4] A map of 1720 represents them south of Green bay, while the territory occupied by them in 1716 had a Kikalin village.[5] The map last cited has also "Villages of 4 Nations" near the mouth of Fox river.

In this chapter only the most conservative estimates of Indian populations have been given, and by these it is proved that fully 30,000 Indians used wild rice at one time. Estimating the Ojibwa at 10,000, the Dakota at 6,000, the Menomini at 1,500, the Sauk and Fox at 2,500, the Winnebago at 2,000, the Potawatomi at 2,000, there are 24,000 souls. Besides these there are the Assiniboin, Maskotin, Kickapoo, Huron, Ottawa, and others, all of whom might easily swell the number to a total of 30,000 souls.

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[1] Verwyst, Missionary Labors, Milwaukee and Chicago, 1886, p. 104.

[2] Perrot, Mémoire, p. 52.

[3] Shea, The Indians of Wisconsin, in Wisconsin Historical Collections, vol. III, p. 125 et seq.

[4] Herman Moll, Map of North America, printed before 1716.

[5] Moll, A New Map of the North Parts of America claimed by France, 1720.

Chapter IV

PRODUCTION

Introduction

The world is fortunate indeed that it has turned its attention to the scientific and historic study of human efforts and institutions before primitive man has entirely disappeared. When attention is directed to the effort of production, one is convinced that the first act was simply that of appropriation—as of a club to strike, a stone to throw, a hole to crawl in, fruit to eat. One can not make use of commodities in the past or in the future; he must use them in the present. The hungry primitive man was satisfied when he found food to eat. His want was a present want, but he was often hungry when he could not find the desired food; so at the moment when he conceived the thought of keeping food from a stock of present plenty until a time of future need he took a highly important step in the varied progress of civilization.

In the study of vegetal food production the first attention should be given to indigenous products which require no care, or, in other words, to purely native and spontaneous products.[1] Wild rice is a plant of this sort. It was so seldom planted and the stalks were so seldom cared for that in this regard it is near the bottom of the ladder in the ascent of cultivated plants. Production with regard to wild rice, therefore, is confined chiefly to the gathering and care of the seed. After a general description of the processes of harvesting and preparing the grain, a detailed study of each step in the production will be made, as the methods vary greatly in different localities.

The grain is matured in the latter part of August or in September. Shortly before that time the women often go to the rice fields in their canoes and tie the standing stalks into small bunches (plate LXX). When the grain is sufficiently mature, two persons, generally women, go together into the fields to garner the seed. The stalks are usually so close together in the harvest field that it is impossible to use a paddle, so the canoe is pushed along by a pole. As the harvesters pass among the rice, standing 4 or 5 feet above the water, one of the women reaches out, and, by means of a stick, pulls a quantity of the stalks down

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[1] It is not meant here that all agriculture began with such food products as are produced spontaneously in great abundance. It is quite probable that want did much toward causing primitive people to cultivate the soil. See W J McGee, The Beginning of Agriculture (American Anthropologist, Washington, October, 1895).

INDIAN WOMAN ON HER WAY TO THE RICE BED TO TIE THE STALKS

over the side of the canoe. Then with a similar stick held in her free hand she beats the fruit head, thus knocking the grain into the bottom of the canoe. In this way the grain on both sides of the path is gathered. When one end of the canoe is full, the laborers exchange implements, the harvester becoming boatman and the boatman harvester, and the other end of the canoe is filled on the return trip to the shore. The grain is then taken out, dried or cured, its tenacious hull is thrashed off, and, after being winnowed, it is stored away for future use.[1]

"In the golden-hued Wazu-pe-wee—the moon when the wild-rice is gathered;
When the leaves on the tall sugar-tree are as red as the breast of the robin,
And the red-oaks that border the lea are aflame with the fire of the sunset,
From the wide-waving fields of wild-rice—from the meadows of Psin-ta-wak-pa-dan,
Where the geese and the mallards rejoice, and grow fat on the bountiful harvest,
Came the hunters with saddles of moose and the flesh of the bear and the bison,
And the women in birchen canoes well laden with rice from the meadows."

Gordon, Legends of the Northwest, pp. 58–59.

Sowing and Other Early Care

Perrot wrote that the Assiniboin Indians, west and northwest of Lake Winnipeg, Canada, sowed wild rice in their marshes, which they later came to gather. He says: "Les Chiripinons ou Assiniboûlas sement dans leurs marais quelques folles avoines qu'ils recueillent, mais ils n'en peuvent faire le transport chez eux que dans le temps de la navigation."[2]

At the present time, near Rat Portage, Ontario, there are two small lakes in the vicinity of Shoal lake where the Indians (Ojibwa) have sown wild rice, and where they procure quite a harvest.[3]

The Ojibwa Indians at Rice lake, near Crandon, Forest county, Wisconsin, at times both sow the grain and weed out the large flat grass which grows among the stalks.

The Ojibwa Indians of Lac Courte Oreille reservation, Wisconsin, have a tradition that all the wild rice between their present habitat and Red river of the North has been sown by their ancestors.[4] The finest harvest field now on the reservation is that of Lac Courte Oreille river. It is a sown field. Päskin′, a woman estimated to be slightly over a hundred years of age, says that she remembers when wild rice was

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[1] Attention is called to the following published illustrations of wild rice harvesting by the Indians: 1, Ojibwa Indians: Schoolcraft Indian Tribes, vol. III, pl. 4, p. 64; ibid., vol. VI, p. 552; same by Stickney, Indian Use of Wild Rice, American Anthropologist, vol. IX, pp. 115–121, April, 1896; 2, Chicago Tribune, Sunday edition, October 6, 1898, p. 1. 3, An early picture of the harvest: Bressany, Relation Abrégée de Quelques Missions, Montreal, 1852, p. 237. 4, Dakota Indians: Catlin, Illustrations of the manners, customs, and condition of the North American Indians, 10th ed., vol. II, pl. 278, p. 208, London, 1866. 5, Wisconsin Indians: Olney, Quarto Geography, 1849, p. 37; Bryant, Popular History of the United States, 1878, vol. II, p. 514.

[2] Perrot, Mémoire, p. 52.

[3] Pither, letter, December 5, 1898.

[4] See chapter VI.

gathered in Prairie lake, Barron county, Wisconsin, and sown in Lake Chetak, Rice lake, Bear lake, Moose-ear lake, and Lac Courte Oreille river, all in the near vicinity of their reservation. All of these waters are harvest fields for the Ojibwa of Lac Courte Oreille reservation today.

Awa'sa sowed the grain in Lac Courte Oreille river, and his grandchildren's families now harvest the crop. Several other families on the reservation gather wild rice in harvest fields which they themselves have sown. In the fall of 1899 at least one family gathered grain with which to sow a private field.

Tying

Various reasons are assigned for tying the standing stalks into little bunches or sheaves while the grain is in the milk stage (plates LXXI, LXXII). The stalks are tied with strips of bark, and are left standing two or three weeks to ripen.[1]

Hennepin said in 1697 that the "Nadouessiou" (Dakota) Indian women at Mille Lacs, Minnesota, tie the stalks together with whitewood bark (basswood, *Tilia americana*) to prevent it from being all devoured by flocks of duck, swan, and teal.[2] The unknown author of the Memoir of the Sioux, written some time after 1719, says that the Titoha (a Dakota tribe living 50 leagues west of St Anthony falls, in Minnesota) tie the wild rice into bundles while it is standing, in order that it may die (ripen); then when it is dead they gather it.[3] In 1820 Edward Tanner wrote that the Ojibwa Indians at Sandy lake, Aitkin county, Minnesota, formerly gathered the tops into large shocks, "to render the collecting of the grain easier when ripened. By this means they also obtained it in much larger quantities than at present."[4] In 1820 they did not tie it into bunches.

General Ellis wrote of the Indians in Green Bay county, Wisconsin: "One mode is to go into this 'standing corn' with their canoes, and taking as many stalks as they can compass with their hands, give them a twist and kink, and then turn the bunches downward, leaving them to ripen on the stalks. This gives the party twisting the bunches, a kind of pre-emption to so much of the rice, which before was all common."[5] Carver said: "Nearly about the time that it begins to turn from its milky ftate and to ripen, they run their canoes into the midft of it, and tying bunches of it together juft below the ears with bark,

[1] Rodman, letter, November 11, 1898; Schoolcraft, Summary Narrative, p. 130; Eleventh Census of the United States, 1890; Indians, p. 340.

[2] Hennepin, Nouvelle Decouverte, p. 313* (fol. 0*4); Williamson, letter, November 30, 1898; Flint, Geography and History, vol. I, pp. 84–85; Martin Bressani, Relation Abrégée de Quelques Missions, p. 332; Brown, Western Gazetteer, p. 267; Stuntz, letter, November 24, 1898.

[3] Neill, in Macalester Coll. Cont. Dept. of Hist., Lit., and Pol. Sci., ser. 1, number 10, St. Paul, 1890, pp. 235–236.

[4] Edward Tanner, in Detroit Gazette, December 8, 1820.

[5] Ellis, Recollections, p. 265.

A NARROW BED OF WILD RICE TIED IN BUNCHES OR SHEAVES

leave it in this ſituation two or three weeks longer, till it is perfectly ripe. About the latter end of September they return to the river, when each family having its ſeparate allotment, and being able to diſtinguiſh their own property by the manner of faſtening the ſheaves, gather in the portion that belongs to them."[1] E. S. Seymour wrote: "In the first place, to protect it from black birds, they collect the grain in bunches while the grain is in the milk, and cover each bunch with a band made of the bark of the linden or bass wood tree."

The Ottawa Indians used to so tie the bunches that a pathway was left between the rows: "Vn peu auparauant qu'elle monte en espy, les Sauuages vont en Canot lier en touffes l'herbe de ces plantes, les separant les vnes des autres autant d'espace qu'il en faut pour passer vn Canot lors qu'ils reuiendront en cueillir le grain."[2] There is little doubt that all of the tied rice was similarly arranged in rows, as that would be the simplest manner to tie it, and would afford the easiest way to gather it when the laborers used canoes.

It is seen from the above quotations that the chief reason for tying the stalks is that the grain may be saved until it is matured. Many kinds of birds consume it with avidity when they can get at the heads, and if it is tied up it is also much less liable to be destroyed by rain or wind storms.

The care in tying is shown in a letter by Roger Patterson, government farmer of Bad River reservation, Wisconsin, which is here quoted in part: "About August 15th the squaws, using small canoes, go out along the river and gather together the heads of rice, tying them with bark strings into sheaves, taking care to draw them together gently, so as not to break the stems or roots. After being tied and wrapped with bark strings so that the grain will not waste, it is left standing, supported by the stalks that are not broken, about 2 feet above the water."[3]

The women at Lac Courte Oreille reservation tied their wild rice in the season of 1899 in the following manner: They were camping with their entire family at the field and spent several days at this particular process while the grain was in the milk (see plate LXXII). A large round ball of "bast," the bark string with which they were to tie the bunches, was ready behind them in their canoes. This ball is often a foot in diameter and is made of strings of the green inner bark of basswood; it is so wound that it unwinds from the inside, like the modern binding twine. The string averages a quarter of an inch in width. A forked pole is used to push the canoe into the thick, heavy mass of stalks, it being impossible to paddle in such a forest, and the mud bed being too soft to allow a straight pole to be used. Then the

[1] Carver, Travels, p. 523.
[2] Relations des Jésuites, 1663, p. 19.
[3] Patterson, letter, November 23, 1898. See also Rodman, letter, February 14, 1899.

woman reaches out around the stalks with a curved stick and hauls them toward the side of the canoe (see figure 47). Both this sickle-shaped stick and her hands are employed to form the stalks into a bunch. When the bunch is formed the woman reaches up to her shoulder and pulls over the bark string, which passes from the ball behind her through a loop on the back of her dress immediately below the shoulder. While holding the stalks with one hand, she lays the string down along the bunch for several inches, and, suddenly checking this movement, begins rapidly to wind the string around the stalks toward their tops. In this way she makes secure the lower end of the fastening by putting several wrappings of the string around it. She winds the stalks

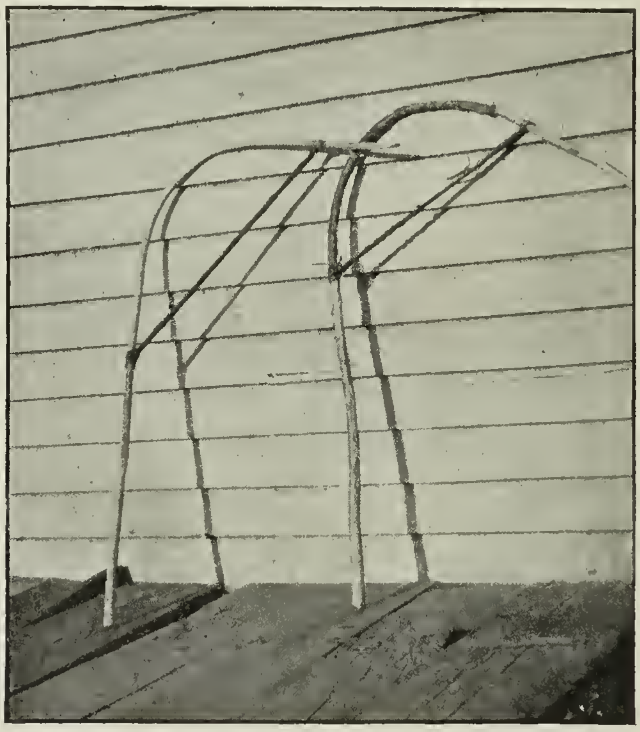

FIG. 47—Sickle-shape sticks used to draw the stalks within reach for tying.

for about 2 feet, and then bends the top of the bunch over in the form ∩ and fastens it to the upright part by a single loop and single knot of the string, which is then cut with a knife, and the tying process is completed. These bunches are usually 3 feet long from the lowest wrapping to the top of the stalks, but the stalks are usually not tied closer than 10 or 12 inches to the ends. Such long bunches are made necessary by the uneven length of the stalks. The fruit heads are quite uniformly 1 foot long. Probably one-half of the kernels are securely wrapped with the string, while the others, at the top of the stalks, are kept from jarring out by the steady support of the bunch. As much as 8, 10, and 12 feet of the string is used to tie a single sheaf.

TIED BUNCHES OF WILD RICE

The bunches are made with great uniformity and regularity. A row is tied on both sides of the canoe, and when the limit of the field is reached the laborer turns around in the canoe, and returning, ties two other rows by the side of and parallel to the last. The fields at this period are very attractive. The graceful bunches and regular rows, either straight or following the outer limits of the beds, are extremely pleasing to see.

At present the Menomini Indians tie their rice only where the water is too shallow to allow canoes to travel.

The mechanical means necessary in the process of tying are very simple. The canoe (see plate LXXIII) is indispensable. The only material spoken of which is used to tie the stalks is basswood bark in strings or strips. It has also been noticed that at times the stalks were held together by being twisted to form a bunch. A sickle-shaped stick, about 3½ feet long, is used to draw the stalks within reach for tying.

Gathering

The previous process, that of tying, is not an essential one in the harvest of wild-rice grain, though, as has been shown, it is not uncommon. The first necessary step in the entire harvest is the gathering of the seed, and, while the grain is always gathered in canoes or other craft (there is a minor exception among the Menomini), there is, in the gathering, great variety in means and method. It is usually done by women. It is customary for the families which harvest wild rice to move to the fields during the harvest period, which lasts about one month.

In the Algonquian language *manominikewin* means "the gathering of wild rice."[1] *Nin manominike* is "I gather wild rice;"[1] *manominike* signifies "he gathers wild rice"[2] (Wilson spells the same term *munkoomineka*[3]). The wild-rice bag used in harvesting is called *manominiwaj*.[4] In the Dakota language *psin ati* means "to pitch a tent at the rice [fields],"[5] while *tate psin* is "wild-rice wind."[6]

Radisson wrote of the Dakota: "They have a particular way to gather up that graine. Two takes a boat and two fticks, by w^ch they gett y^t eare downe and gett the corne out of it."[7]

The following account came from Sandy lake, Aitkin county, Minnesota, in 1820:

> It is now gathered by two of them [women] passing around in a canoe, one sitting in the stern and pushing it along, while the other, with two small pointed sticks, about three feet long, collects it in by running one of the sticks into the rice, and bending it into the canoe, while with the other she threshes out the grain. This she does on both sides of the canoe alternately, and while it is moving.[8]

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[1] Baraga, Otchipwe Dictionary.
[2] Verwyst, Geographical Names, p. 393.
[3] Wilson, Manual of the Ojebwa Language.
[4] Baraga, op. cit.
[5] Riggs, Dakota-English Dictionary.
[6] Gordon, Legends of the Northwest, p. 58.
[7] Radisson, Voyages, p. 215.
[8] Edward Tanner, in Detroit Gazette, December 8, 1820.

General Ellis wrote that the Indians in Green Bay county, Wisconsin, in pushing the canoe used a "long, light, slender pole, provided with a fork at one end, to prevent its sinking too deep into the soft muddy bottom."[1]

Catlin said of the Dakota that one woman paddled the canoe while the other bent the stalks over and beat out the grain, as is told above.[2] The Dakota used to gather the grain and carry it home in sacks.[3]

The Potawatomi Indians, of southwestern Michigan, gathered the grain as follows: They "would push the boat into the thick rice, bend the tops over the boat, and pound it out with 'rawagikan,' a stick for the purpose."[4]

The Ojibwa women of Bad river, Wisconsin, bend the tied bunches over the side of the canoe, untie the bark band, and beat out the grain with a short stick.[5] It is customary to untie the bunches before beating them.

At Fond du Lac (Lake Superior), Minnesota, two persons of either sex, or both, go out in a canoe, the forward person working it ahead with either a paddle or a forked pole. The one in the stern beats the rice out, using two sticks, one to bend the rice over and the other to beat the heads.[6] Harmon saw the Indians gathering the grain "with a hooked stick, in one hand, and a straight one in the other."[7]

Again we read that the "Fols Avoines" (Menomini) west of Green bay, Wisconsin, beat the grain off into a canoe lined with blankets.[8] Another variation is found in that after the band about the stalks was cut and removed one of the harvesters bent the heads down over the canoe with a stick while the other with a pole beat off the grain.[9]

Dr Hoffman, in his monograph, The Menomini Indians, wrote that, in 1892, "at the proper season the women, and frequently the men as well, paddle through the dense growth of wild rice along the shores of the lakes and rivers, and while one attends to the canoe, the others grasp with one hand a bunch of rice stalks, bend it over the gunwale into the boat, and beat out the ears of rice."[10] In 1899 the Menomini still gathered most of their rice in canoes from untied stalks, but where the water was too shallow for canoes, the stalks were tied, and the grain was beaten out on mats spread upon the water between the rows. The stick with which they beat the heads is called "pawa'qikan."

[1] Ellis, Recollections, p. 266.

[2] Catlin, North American Indians, vol. II, p. 208.

[3] Williamson, letter, November 30, 1898. This letter reads as though the grain was taken home before it was cured and hulled. Because of the danger from the Ojibwa, who dominated the rice fields during the period covered by the letter, it is not improbable that such was the case.

[4] Pokagon, letter, November 16, 1898.

[5] Patterson, letter, November 23, 1898.

[6] Phalon, letter, December 27, 1898.

[7] Harmon, Journal, p. 142.

[8] Brown, Western Gazetteer, p. 267; also Flint, Geography and History, vol. I, p. 85.

[9] Seymour, Sketches of Minnesota, p. 183; see also Schoolcraft, Indian Tribes, vol. III, p. 62 et seq.

[10] Hoffman, The Menomini Indians, p. 291.

At Rice lake, Ontario, "two go with a birch canoe, into the thickest part of it [the rice field] and with their paddles thresh it [the grain] into their canoe."[1]

Again it is recorded that the Ottawa bend the bunches over the canoe and shake the grain into it: "Le temps de la moisson estant venu, ils menent leurs Canots dedans les petites allées qu'ils ont pratiquées au trauers de ces grains, et faisant pencher dedans les touffes amassées ensemble, les égrainnent."[2]

In all of the above gathering it is simply the grain which is removed. Two instances are found, however, in which the entire fruit-head is cut off and taken to the shore in the canoe, and still others in which the stalks are cut in sheaves and taken thus to the shore.

At Rice lake, Ontario, we find that "one person steered the canoe with the aid of the paddle along the edge of the rice beds, and another with a stick in one hand, and a curved sharp-edged paddle in the other, struck the heads off as they bent them over the edge of the stick; the chief art was in letting the heads fall into the canoe."[3]

At Rat Portage, Ontario, sticks about 2 feet long are used by the gatherer who "strips off the heads."[4] A forked pole is used to push the canoe, but the boatman sits at the bow instead of at the stern. The men and not the women gather the grain there.

At Moose-ear river, Barron county, Wisconsin, in 1892 the women and boys went through the field in canoes, and with knives cut the stalks about 2 feet long. They then tied them in bunches about half as large as a sheaf of wheat, and brought them to the shore.[5] The Green Bay county, Wisconsin, Indians, who made bunches by giving them "a twist and kink," cut these bunches with knives and then brought them to the shore.[6] The late Chief Pokagon wrote of the Potawatomi Indians of St Joseph river valley, Michigan, that "It [wild rice] was sometimes gathered in bundles and kept in that way for winter use."[7]

The Indians at Lac Courte Oreille reservation also gather what they call "green wild rice." When they are at the fields to tie the bunches they strip off the grain into their canoes by simply pulling the closed hand over the fruit-heads. This grain, then in the milk, is parched and consumed during the period immediately before the mature grain is gathered, though some families at times cure a sufficient quantity for consumption during the year. The grain in this state is much lighter in color than that which is cured when more mature.

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[1] Jones, Life and Journals, pp. 259-260; also Chamberlain, Notes on the History, Customs, and Beliefs of the Mississagua Indians, in Journal of American Folk-Lore, vol. I, 1888, p. 155.

[2] Relations des Jésuites, 1663, p, 19; also Wisconsin Historical Collections, vol. I, p. 74.

[3] Traill, Canadian Crusoes, p. 188.

[4] Pither, letter, December 5, 1898.

[5] John Hutchinson, letter, Elroy, Juneau county, Wisconsin.

[6] Ellis, Recollections, p. 265.

[7] Pokagon, letter, November 16, 1898.

Again, as in the tying of the stalks, the canoe is indispensable in the grain-gathering. At times a blanket is spread in the bottom; the canoe is propelled by a paddle, a pole, or a forked stick, sometimes the canoeman propels the canoe from the stern and sometimes from the bow. The grain may be gathered into the canoe by one person, who may hold the stalks in one hand and beat the grain out with a stick, or with two sticks, or sometimes with a paddle; or two persons may gather the rice, one holding the stalks over the canoe while the other beats out the grain with a pole. Again, the heads are clipped off over one of the sticks, and this is done either with another similar stick, or with a sharp-edged curved paddle. At other times the grain is shaken out. Knives are used to cut the bundles which are tied, sometimes before cutting and sometimes after.[1]

Curing and Drying

As soon as the grain is gathered it is taken to the shore, and ordinarily the curing process begins immediately. This work also usually falls to the women. A slight movement of the stalk by bird or wind or rain will cause the grain to drop into the water when it is fully ripe, hence it must be gathered just before maturity. This necessitates that the rice be artificially ripened or cured; when thus ripened it will not germinate. It is almost always necessary thus to prepare the grain in order that the tenacious hull may be easily removed.

There are three ways in which the grain is cured, viz, by the sun, by smoke and heat from a slow fire underneath it while spread on a scaffolding, and by parching or "popping" in a vessel.

The sun-dried grains become almost black, the kernels varying from black through the browns to greenish grays. The Dakota Indians of Titoha village, about 50 leagues west of St Anthony falls, Minnesota, early in the eighteenth century, sun-cured their rice.[2] On Fond du Lac reservation there is a double process: After being gathered, it is taken ashore, laid on birch bark or blankets spread on the ground, and dried by the sun. After being dried, which takes about twenty-four hours, it is placed in a large copper kettle and roasted over a slow fire, being continually stirred with a paddle until the hull is thoroughly roasted, when it is ready for hulling. On Moose-ear river, Barron county, Wisconsin, in 1892, after the grain was cut, tied in bundles, and brought to the shore, it was spread on a long rack to dry in the sun. The stalks were laid on the rack in two rows, each having the heads in the same direction. Next, a blanket was spread on the ground, and a pole was placed with its lower end on the blanket, while the other end was held at a slight angle above. Over this pole the stalks, with the now dried fruit heads, were held, and the grain

[1] A view of the rice field after the grain has been gathered is shown in plate LXXIV, *a*.

[2] Neill, Memoir of the Sioux, p. 236.

BIRCH-BARK CANOES OF WILD RICE GATHERING OJIBWA

was beaten out with a stick. It was again dried or cured before hulling, but the details of the process could not be ascertained.[1]

The Winnebago, who still gather wild rice in large quantities, cure the grain on a rack over a slow fire.[2] In 1820 the Indians around Sandy lake, Aitkin county, Minnesota, often cured their rice on a scaffolding of small poles about 3 feet high (see plates LXXIV *b* and LXXV *a*). This rack was covered with cedar slabs, upon which the grain was spread. A slow fire was then kept burning beneath until the kernels were entirely dry. It required about a day to dry a scaffoldful. Again, mats were spread over a scaffolding, on which the rice was put and cured by a fire underneath.[3] Marquette said that the Indians on Green bay cured their rice on a wooden lattice, under which they kept a small fire for several days, or until the grain was well dried.[4]

By the Mississagua Indians about Rice lake, Ontario, the following method was employed in 1888:

> Returning to the shore, they stick into the ground pine or cedar branches, so as to form a square inclosure. Within this they drive in forked sticks, upon which cross-pieces are laid, and upon these latter mats of bass-wood or cedar-bark are placed. Under this framework a fire is then lit, and the hedge of green branches serves to keep in the heat. The rice is spread upon the mats, and kept turned about with the paddle until dried.[5]

A recent method of the Dakota was to build a scaffold from 20 to 50 feet long, 8 feet wide, and about 4 feet high. This was covered with reeds and grass, upon which the grain was spread. A slow fire was then kept burning for thirty-six hours so as slightly to parch the hull.[6] At Rat Portage, Ontario, the grain of the first day's gathering is parched, after which a scaffolding is made "with poles about eight feet high and covered . . . with cedar slabs, and over these grass, and then a layer of rice." A fire is built beneath to dry the grain.[7]

The parched or popped rice is lighter in color than that cured in the sun. The kernel is also swelled almost to twice the diameter of the sun-dried kernel, and much of it is slightly popped or cracked open. However, it does not open like popped corn, but most of the grains when parched have a peculiar translucent crystalline appearance. In 1820 Edward Tanner wrote: "One method of curing the rice, and that which makes it the most palatable, is by putting it in a kettle in small quantities, and hanging it over the fire until it becomes parched."[8] Chamberlain says of the Mississagua Indians, above referred to:

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[1] Information of John Hutchinson, Elroy, Juneau county, Wisconsin.
[2] Information of Winnebago near Elroy, Juneau county, Wisconsin, winter village in 1898-99.
[3] Seymour, Sketches of Minnesota, p. 183.
[4] Shea, Discovery and Exploration, p. 9; also Carver, Travels, p. 524.
[5] Chamberlain, in Journal of American Folk-Lore, vol. I, 1888, p. 155.
[6] Palmer, Food Products of the North American Indians, p. 422.
[7] Pither, letter, December 5, 1898.
[8] Edward Tanner, Detroit Gazette, December 8, 1820.

"When it is desired to parch it, the rice is placed in pots over a slow fire until the grain bursts and shows the white, mealy center." [1] The Ojibwa Indians of northern Wisconsin kiln-dried (i. e., parched) their rice in kettles during the fifties and sixties of the nineteenth century.[2] At Bad river, Wisconsin, it is cured in kettles, but is apparently not parched, as is seen from the following: "Indians like it in dry kettles and pots over a fire until it is scorched brown. The hull will then slip off easily." [3] At Rat Portage, Ontario, as soon as the men come ashore with the rice "the women commence to parch the first day's gathering in the manner corn is popped. They use a kettle over a slow fire." [4] The remainder of the harvest is fire-cured on a rack. The Menomini in 1892 did not cure all the rice as soon as it was gathered; at times it was not dried until after the threshing and winnowing.[5] In 1899 the same Indians had two methods of curing the rice. Such grain as was for immediate use was parched in a kettle, while the remainder of the crop was fire-cured on racks covered with rush matting. No new phases of the curing process were learned at the Lac Courte Oreille reservation. They cure the grain both by parching in a kettle and by fire-drying on a rack, the closely laid cross sticks of which were covered with long fresh marsh grass. A birch-bark box, or mocock, is generally used to carry the grain both from the canoe to the rack and from the drying rack to the place of threshing. Although these Indians esteem the parched rice more highly than the fire-cured variety, yet, on account of the extra labor in parching, they fire-dry fully four times as much as they parch.

Not many mechanical implements are used in curing the rice. It is sun-cured on blankets, on birch bark, and on scaffolds of sticks. It is fire-cured and parched in kettles. Scaffolds are covered with sticks, cedar slabs, reeds, grass, and mats of basswood and cedar bark. These scaffolds are at times nearly surrounded by a hedge of pine or cedar branches. A paddle is used to stir the grain while parching in the kettle, and also at times while drying on the rack.

Thrashing

From the time the grain is removed from the fruit head until it is thrashed, it is covered with a close-fitting hull. The grain while in this dress appears almost exactly like a long-bearded oat (see plate LXXVI). With few exceptions all the preceding work of harvesting is done by the women, who, at times, are assisted by the children. The work of hulling falls to the men, or now and then to the boys, only two instances being noted in which the women did this work.

There is little question that woman was man's first thrashing-machine, and that her hands were first employed to separate the seeds from

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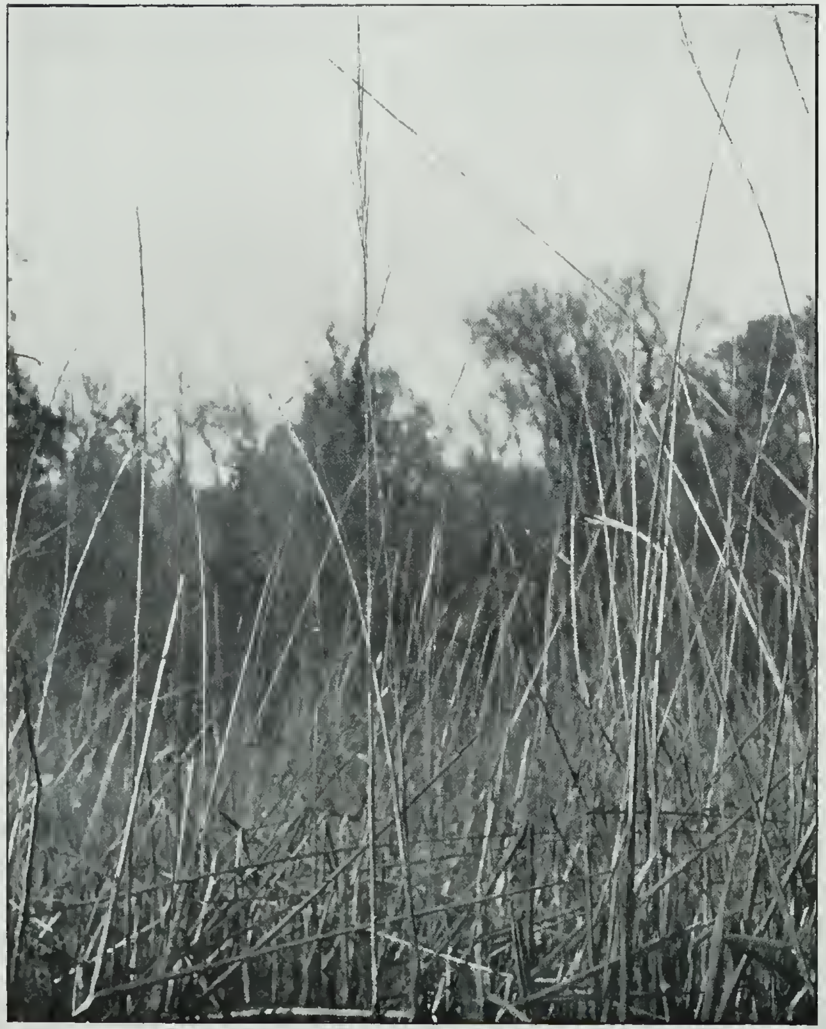
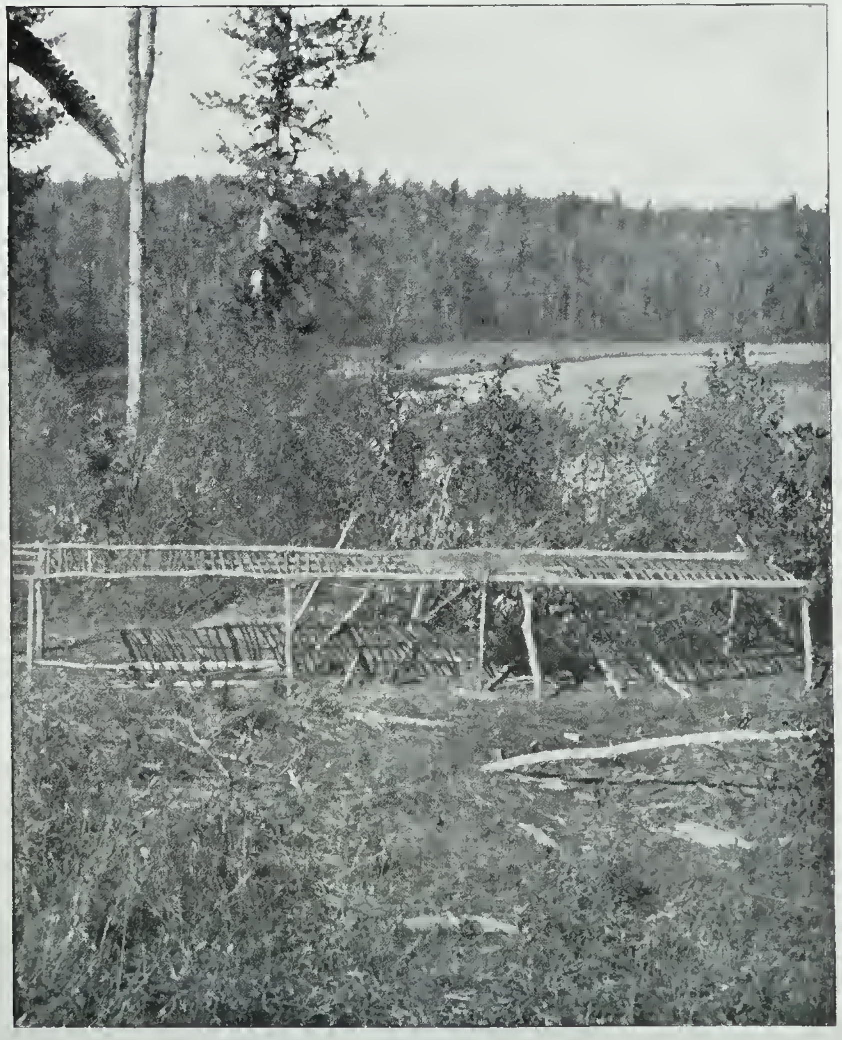
[1] Chamberlain, op. cit., p. 155.
[2] Stuntz, letter, November 24, 1898.
[3] Patterson, letter, November 23, 1898.
[4] Pither, letter, December 5, 1898.
[5] Hoffman, op. cit., p. 291.



A, WILD-RICE FIELD AFTER THE HARVEST



B. DRYING RACK FOR GRAIN

the fruit head and hull. It seems also true that as soon as small seed was gathered in any considerable quantity the feet were taught to do the work of hands. Here, then, is the invention of the treadmill thrashing-machine. This is the power mostly employed in the thrashing of wild rice, although sticks are used—sometimes like flails and again like churn dashers. The hull is also rubbed or shaken off in blankets and baskets.

Along the west shore of Lake Koshkonong, in Jefferson county, Wisconsin, a great many holes were yet visible in 1895 which were the basins in which the rice hulls had been tread loose from the grain, though it is questionable whether wild rice has been gathered there during the last half century. Fifty years ago Schoolcraft also reported such depressions in great numbers around Rice lake, Barron county, Wisconsin. He said: "A skin is put in these holes, which are filled with ears. A man then treads out the grain. This appears to be the only part of rice making which is performed by the men. The women gather, dry, and winnow it."[1] Edward Tanner said that in 1820 a hole was dug in the ground about a foot and a half deep and 3 feet in circumference, into which a moose skin was usually put. The rice was then put in and trodden out by an Indian. "This is very laborious work," he says, "and always devolves upon the men."[2] Ellis, in speaking of the Indians in Green Bay county, Wisconsin, wrote that a hole is made to contain about 1 gallon; "the rice is then tied up in a deerskin, placed in the hole, and tramped upon with the feet till the hull is removed."[3]

Another variety of the treadmill is found in the following two accounts: "A hole is dug in the ground, and about a bushel of rice is put in it and covered with a deerskin. A man, steadying himself by a stake driven into the ground, jumps about on the grain until the hulls are removed."[4] At Lac Courte Oreille reservation, Wisconsin, two such stakes are driven into the ground and tied together. They project from the ground at an angle of about 60° and lean slightly away from the thrashing hole (see plate LXXV *b*). The man supports himself upon these props while treading out the grain. It is only fair to say that he tries to have a new pair of buckskin moccasins for this work—but sometimes buckskin is scarce. The thrashing holes are of two varieties. One is a simple excavation about 2 feet in diameter and 18 inches deep. This is lined with a deerskin, into which the rice is poured. The thrasher treads directly on the grain. The other kind of hole is similar in size, but is lined at the bottom with a block of wood and at the sides with hand-made staves about half an inch thick, which overlap like clapboards. In this hole also the thrasher treads directly on the grain.

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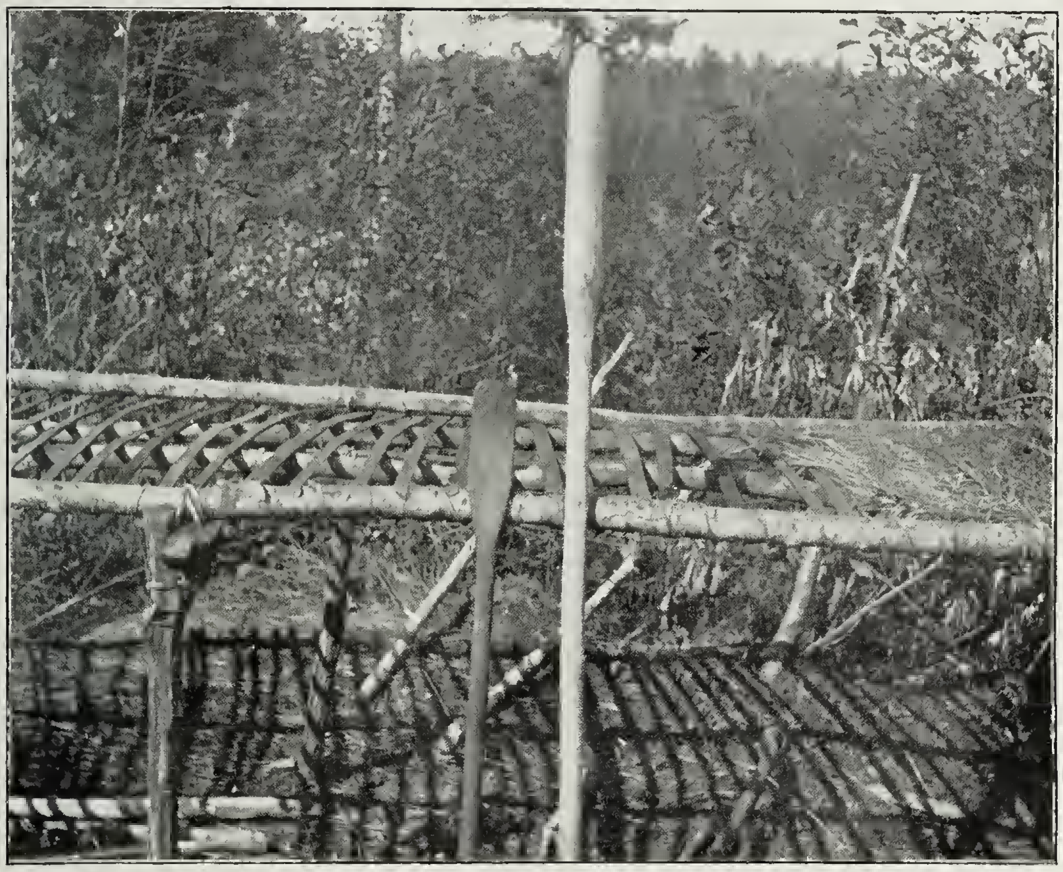
[1] Schoolcraft, Thirty Years with the Indian Tribes, p. 385.
[2] Edward Tanner, Detroit Gazette, December 8, 1820.
[3] Ellis, Recollections, p. 266.
[4] Seymour, Sketches of Minnesota, pp. 183, 184.

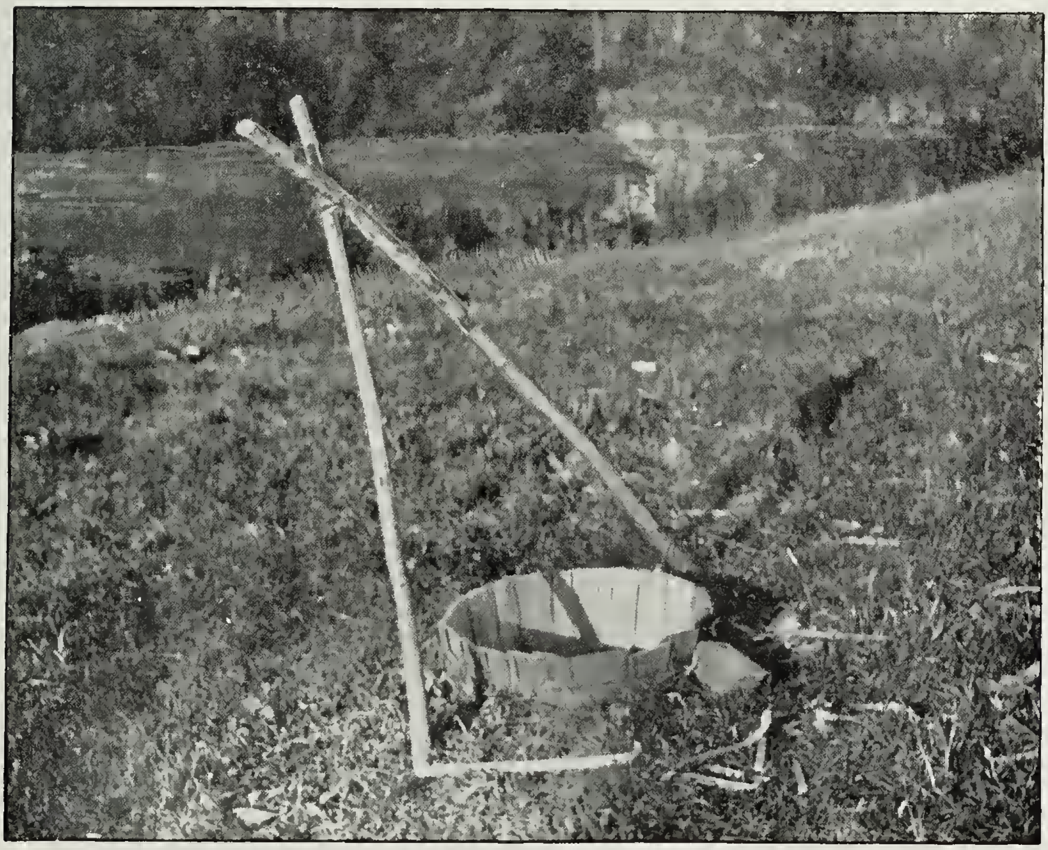
Marquette said that they put the rice "in a skin of the form of a bag," after which it was tread out in a hole.[1] The Ottawa in the middle of the seventeenth century tread out the grain in a ditch. This thrashing was done immediately after the gathering, and it was cured after instead of before the thrashing: "Quand le Canot est plein, ils vont le vuider à terre dans vne fosse preparée sur le bord de l'eau, puis auec les pieds ils les foulent et remuent si longtemps, que toute la balle s'en detache."[2] Another glimpse of the worker is obtained from the Dakota in the early seventies of the nineteenth century. To separate the hull from the grain a hole about a foot wide and deep was dug in the ground and lined with skins. About a peck of rice was put in at a time; an Indian stepped in and with a half jump on one foot and then on the other tread the grain free.[3] A letter from Bad River reservation, Wisconsin, mentions that moccasins are worn by the Indian as he treads the grain in a tub.[4] In most places moccasins are usually worn in this work, but in the autumn of 1899 the men at Vermilion Lake reservation, Minnesota, tread their grain out barefoot, and this is their usual method. In the early part of the eighteenth century the Dakota tread out their grain in a wooden trough.[5] In 1829, at Rice lake, Ontario, the boys tramped the grain in a hole lined with a deerskin,[6] and of these Indians the same thing is written again in 1888. In neither case is the grain cured before it is threshed.[7] However, they also thrash it in another manner, to which later reference will be made. The curing and thrashing processes were curiously combined by the Ojibwa in northern Wisconsin in the middle of the nineteenth century. A green or fresh deerskin was staked out and stretched over a quantity of coals. The rice was then poured on this suspended skin and a small boy was put to treading it.[8]

In 1822 the Menomini thrashed their rice in a hole lined with a deerskin. The grain was "pounded with a stick (having a thick end to it), for the purpose of disconnecting the husk from it."[9] Hoffman wrote the same facts seventy years later, saying that the hole was 6 inches deep and 2 feet across.[10] Again he says: "Some of the Menomini women make a special form of bag in which to beat out the rice. This bag is 2 feet wide by from 18 to 20 inches deep, and is woven of bark strands. It resembles very much an old-fashioned carpetbag. After the rice is put into this, the bag is laid into a depression in the ground and beaten to separate the hulls."[10] In 1899 their parched

[1] Shea, Discovery and Exploration, p. 9.
[2] Relations des Jésuites, 1663, p. 19.
[3] Palmer, Food Products of the North American Indians, p. 422.
[4] Patterson, letter, November 13, 1898.
[5] Neill, Memoir of the Sioux, p. 296.
[6] Jones, Life and Journals, p. 260.
[7] Chamberlain, Notes on the History, Customs, and Beliefs, p. 155.
[8] Stuntz, letter, November 24, 1898.
[9] Morse, Report, appendix, p. 47.
[10] Hoffman, The Menomini Indians, p. 291.



A, SECTION OF DRYING RACK



B, STAVE-LINED THRASHING HOLE FOR TREADING OUT THE GRAIN

rice was hulled by tramping in a hole in the earth. The laborer was supported by leaning upon a single stick or light post driven into the ground. But the greater part of the crop, the fire-cured grain, was thrashed otherwise. Usually 15 to 25 bushels were dumped in a ditch 10 or 15 feet long and 2 feet deep; then two men with crooked sticks, *pawa'qwikanäq'tik*, flailed the hulls loose. High screens were erected on both sides of the ditch to check the flying kernels.

At Fond du Lac, Lake Superior, the grain is "churned or pounded" with a stick "shaped like a handspike, being largest at the butt." The hole is about "knee-deep with a solid block in the bottom, the sides being lined with staves, after the fashion of a barrel and of about the same diameter."[1]

Besides treading off the hulls the Indians at Lac Courte Oreille reservation thrash their grain with the churndasher-like sticks. A deep hole is lined with the previously mentioned handmade staves, or a barrel is sunk almost its full length into the ground; this is then nearly filled with the grain. One or two persons, of either sex, pound up and down with the heavy-end sticks—frequently holding two of them (see plate LXXVII *a*).

The Potawatomi of St Joseph river valley, Michigan, sometimes pounded the grain in a sack made for the purpose, and sometimes in a skin-lined hole in the earth. This instance and the ones immediately preceding and immediately following are the only ones in which reference is made to the women as thrashers. The late Chief Pokagon wrote that this work was done by the women and children, and sometimes by the men.[2]

The Winnebago thrash their rice on a blanket laid upon the ground; around three sides of this blanket a cloth screen 2 or 3 feet high is erected in order to confine the flying kernels. The thrasher, man or woman, sits at the open side of the blanket with a stick in each hand and flails the grain.[3] Hoffman refers to exactly the same process for the Menomini in 1892, except that mats are used on the ground and for screens, and a depression is dug, into which the ground mat is laid.[4] The present Mississagua Indians thrash their rice also by shaking it in large open baskets after the grain has been thoroughly dried.[5]

Carver wrote that after the grain was cured the Indians trod or rubbed off the hull.[6] Williamson says that the Dakota beat the grain until the hulls burst, when they will rub off.[7] About 1840 the Potawatomi at Grass lake, Lake county, Illinois, had two ways of hulling their rice. One method was employed immediately after gathering,

[1] Phalon, letter, December 27, 1898.
[2] Pokagon, letter, November 16, 1898.
[3] Information from Winnebago near Elroy, Juneau county, Wisconsin, winter 1898–99.
[4] Hoffman, op. cit., p. 291.
[5] Chamberlain, op. cit., p. 155.
[6] Carver, Travels, p. 524.
[7] Williamson, letter, November 30, 1899; also Kinzie, Wau-Bun, p. 67.

when the grain was roasted on hot, flat stones, thus causing the hulls to crack and loosen, after which they were rubbed off. The other method was to wait until the grain was ready to be consumed, when the kernel, inclosed in its hull, was pounded. This pounded mass was then put into a vessel of water. The hulls, which would remain on the surface of the water, were then skimmed off, and the water and pounded kernels made into a very palatable soup.[1]

The implements for thrashing are neither varied nor numerous. Holes dug in the ground are lined with skins and slabs of wood. Wooden troughs, blankets or mats, bags of skin, and bags of woven bark are all used to hold the grain while being thrashed. Stakes are sometimes used to steady the laborer; he usually wears moccasins while treading the grain. Cloth and mats are used as screens. Sticks used like flails and like churn-dashers are also employed. The grain is at times pounded on flat stones, and again it is shaken in large open baskets.

Winnowing

It is not difficult to draw sharp lines separating the various processes which have been described thus far in the harvesting of wild rice. The entire winter, the spring, and most of summer intervene between the sowing and the tying. Between the tying and the gathering from several days to several weeks elapse; and though the gathering and the curing may be done on the same day, and even at the same time by different women, the gathering is on the water, while the curing is on the land. The curing and the thrashing are plainly distinct processes; but it is only because of division of labor that a sharp line may be drawn between the thrashing and the winnowing. The Indian silently stalks into the labors of rice harvesting when the thrashing begins, and when it is completed he silently stalks out again, leaving the woman to lift up the pile of mixed kernels and chaff in order that the wind—nature's fanning mill—may separate them. If the wind does not blow when the grain is ready to winnow, the cleaner uses a fan.

Ellis wrote that in Green Bay county, Wisconsin, the hulls were blown off by the wind.[2] The Ojibwa women of Fond du Lac reservation, Minnesota, and Bad River reservation, Wisconsin, all winnow their wild rice by means of the wind.[3] Mr Phalon writes of Fond du Lac, "A blanket or birch bark is spread on the ground, and with the help of a good stiff breeze the grain is fanned out." The women at Lac Courte Oreille reservation, as I saw the process in the autumn of 1899, put a peck of the thrashed grain into a birch-bark tray

[1] Paddock, letter, January 20, 1899.
[2] Ellis, Recollections, p. 266.
[3] Phalon, letter, December 27, 1898; Patterson, letter, November 13, 1898.

WILD-RICE KERNELS BEFORE THRASHING

(plate LXXIX *b*), which is about 3 feet long, 2 feet wide, and 7 or 8 inches deep. They then grasp both ends of the tray, and by a very simple yet clever movement gradually empty the chaff. The tray is lifted several inches and carried slightly outward. This upward and outward movement is checked quite suddenly, and the tray, while being drawn toward the body of the laborer, is let down again. The light chaff is thus spilled over the outer edge when the tray is at its highest point and just as it is suddenly jerked toward the laborer. However, because of the rapidity with which this shaking is done, the movements appear neither sudden nor jerky, and the chaff falls almost constantly (see plate LXXVII *b*).

Among the Menomini, "on a windy day, by means of a birch-bark tray, the rice is cleaned. . . . Sometimes the rice and hulls are separated by spreading on a mat and fanning with a bark tray."[1] The Sandy lake Indians in 1820 cleaned their rice with "a fan made of birch bark, shaped something like those used by farmers. This is the most expeditious way of cleaning it."[2]

The only implements used in winnowing are birch-bark fans, blankets and birch-bark trays (which are spread upon the ground to catch the grain).[3]

Storing

While the American farmer locks his granary that its contents may be safe, the Indian hides his harvest for safety. In fact, the common term by which the Indian granary is now known throughout the Northwest is the French term *cache*, or hiding place. It is a part of an Indian's code of morals not to steal from his friends, but it is equally a virtue to steal from an enemy. Inasmuch as tribes ordinarily habitually steal from one another, the fall harvest of wild rice must be kept in a place of safety. Its hiding was formerly much more necessary than at present, for before the time of settled homes the families broke up the harvest camp immediately after completing their labors, and repaired to their fall festivities or hunting-grounds. As will be seen later, there was both a subjective and an objective reason why the Indians did not store away larger quantities of wild rice. One reason was that they would not gather large quantities of the grain, and the other reason was that the crop so often failed that at times they could not harvest abundantly. However, now and then the instinct of frugality was strong enough to assert itself. Atwater said that the Winnebago women contrived to save, by hiding, some of their food in time of abundance. They often buried rice and

[1] Hoffman, op. cit., p. 291.

[2] Edward Tanner, op. cit., December 8, 1820; see also Seymour, op. cit., pp. 183, 184; Kinzie, op. cit., p. 67; Jones, op. cit., pp. 259, 260; Gheen, letter, November 15, 1898.

[3] The appearance of the grain after winnowing is shown in plate LXXVIII.

maize in the ground to keep it from being stolen.[1] Throughout Wisconsin in 1843 the grain was deposited in the ground to be taken out when needed for food.[2]

After winnowing the grain "They [the Titoha band of Dakota, in the early part of the eighteenth century] carry away as much of it as they think they need and store the rest in the ground. They also put some to rot in the water, and when they return in the spring they find it delicious, although it has the worst kind of an odor."[3] The "Mantantons" (Mandan) kept rice in sacks, for, after a great feast made in honor of Le Sueur, the chief "fit present a M Le Sueur d'un esclave et d'un sac de folle avoine."[4]

At Sandy lake, in 1820, the rice when cured was "put into sacks of about a bushel each. A sack is valued at two skins. . . . A skin is valued at two dollars."[5] Carver wrote one hundred and thirty years ago that when the rice was fit for use the Dakota put it into skins of fawns and young buffalo, taken off nearly whole for this purpose, and sewed into a kind of sack, wherein they preserved it until the next annual harvest.[6] The Indians at Rat Portage, Ontario, "make bags of the inside bark of cedar in which they store the rice. They hold from $\frac{3}{4}$ to 1 bushel each."[7] Schoolcraft said that the winnowed rice "is then put into coarse 'mushkemoots,' a kind of bag, made of vegetable fiber or twine, with a woof of some similar material. Occasionally this filling material is composed of old cloth or blankets, pulled to pieces."[8] Birch-bark boxes were also used, which, after being filled, were frequently buried. The Ottawa Indians used them in the middle of the seventeenth century.[9] The Potawatomi also used these boxes.[10] They were sewed together at the corners with "bast," the inner bark of the basswood, and were called (from the Algonquian) mococks (plate LXXIX *a*).

The Indian granaries here noticed are very simple. They consist of a hole in the ground, into which are put boxes of birch bark and bags made of skin, bags made of the inside bark of the cedar and sometimes of other vegetal fiber, together with twine, etc.

Property-right in Wild Rice

As has been pointed out, most of the labors of wild rice production are performed by women. The women of more than one family fre-

[1] Atwater, Indians, p. 102.
[2] Indian Affairs Report, 1843, p. 434.
[3] Neill, Memoir of the Sioux, p. 236.
[4] La Harpe, Journal Historique, p. 66.
[5] Edward Tanner, Detroit Gazette, December 8, 1820.
[6] Carver, Travels, p. 524.
[7] Pither, letter, December 5, 1898; see also Gheen, letter, November 15, 1898, and Hoffman, The Menomini Indians, p. 291, for the same use of bags.
[8] Schoolcraft, Indian Tribes, vol. III, p. 62.
[9] Relations des Jésuites, 1663, p. 19.
[10] Pokagon, letter, November 16, 1898.

A. THRASHING WILD RICE BY MEANS OF A CHURN-DASHER-LIKE STICK

B. INDIAN WOMAN WINNOWING WILD RICE

quently unite their labors and divide the product according to some prearranged agreement or social custom. It must not be lost sight of, however, that if the food of any worthy family fails, the entire food supply of the soeial group is available to make up the deficiency. Chief Pokagon writes of wild riee among the Pottawatomi: "Our people always divide everything when want comes to the door."[1]

Among many North Ameriean Indian tribes, espeeially those cultivating fields of maize, certain harvest lands are set aside by the tribe, in which the family has a sort of fee tail. In general, it may be said that such a family controls for its own use, but not for disposal in any way, definite harvest lands for stated periods of time, provided it comply with certain requirements—usually those of eultivation.

Marquette reported something similar among the Dakota in 1671. They divided the wild-rice fields so that each eould gather his crop separately without trespassing upon his neighbor's rights. Wild riee "qu'ils partagent entr'eux, pour y faire la réeolte chaeun à part, sans empiéter les uns sur les autres."

Among the Ojibwa Indians property right is quite generally reeognized in wild rice. It seems to be due not to tribal allotment, but to preoecupation. Certain harvest fields are habitually visited by families which eventually take up their temporary or permanent abode at or near the fields. No one disputes their ownership, unless an enemy from another tribe, in which ease might establishes right. The field or crop is sometimes distinguished by a personal mark, as is shown in the following cases. Carver said that after having tied the bunehes they went to gather the crop, "when eaeh family having its feperate allotment, and being able to diftinguifh their own property by the manner of faftening the fheaves, gathers in the portion that belongs to them."[2] Ellis referred to a similar custom at Green bay. He spoke of twisting the standing stalks into bunches, and says: "This gives the party twisting the bunehes, a kind of pre-emption to so mueh of the rice, whieh before was all common."[3] Sehoolcraft, in speaking in a general way of wild rice gathering in Michigan, Wiseonsin, Iowa, Minnesota, and the upper Mississippi and Missouri valleys, said that the places where eaeh family is to gather are generally selected and known beforehand.[4] Of course, if one has sowed a field, no one, unless a tribal enemy, would think of disputing the ownership of the sower, and such rice beds fall to the kin, as would personal property.

Amounts of Wild Rice Harvested

The primitive Indians do not take production very seriously. Indeed, they do not take it seriously enough for their own welfare, for often they are in want in an unnecessarily short time after the harvest. In

[1] Pokagon, letter, November 16, 1898.
[2] Carver, Travels, p. 523.
[3] Ellis, Recollections, p. 265.
[4] Schoolcraft, Indian Tribes, vol. III, p. 62 et seq.

the case of wild rice, their want was due not to overproduction and underdistribution, but to underproduction.

In 1820 Edward Tanner wrote: "One family ordinarily makes about five sacks of rice [5 bushels]; but those who are industrious sometimes make twenty-five—though this is very rare."[1] At Pelican Lake, Wisconsin, they gather about 12 or 15 bushels per family. They could gather more "if they did not spend so much time feasting and dancing every day and night during the time they are here for the purpose of gathering."[2] In the following table (A) an attempt is made to show the state of wild rice production between the years 1852 and 1898.

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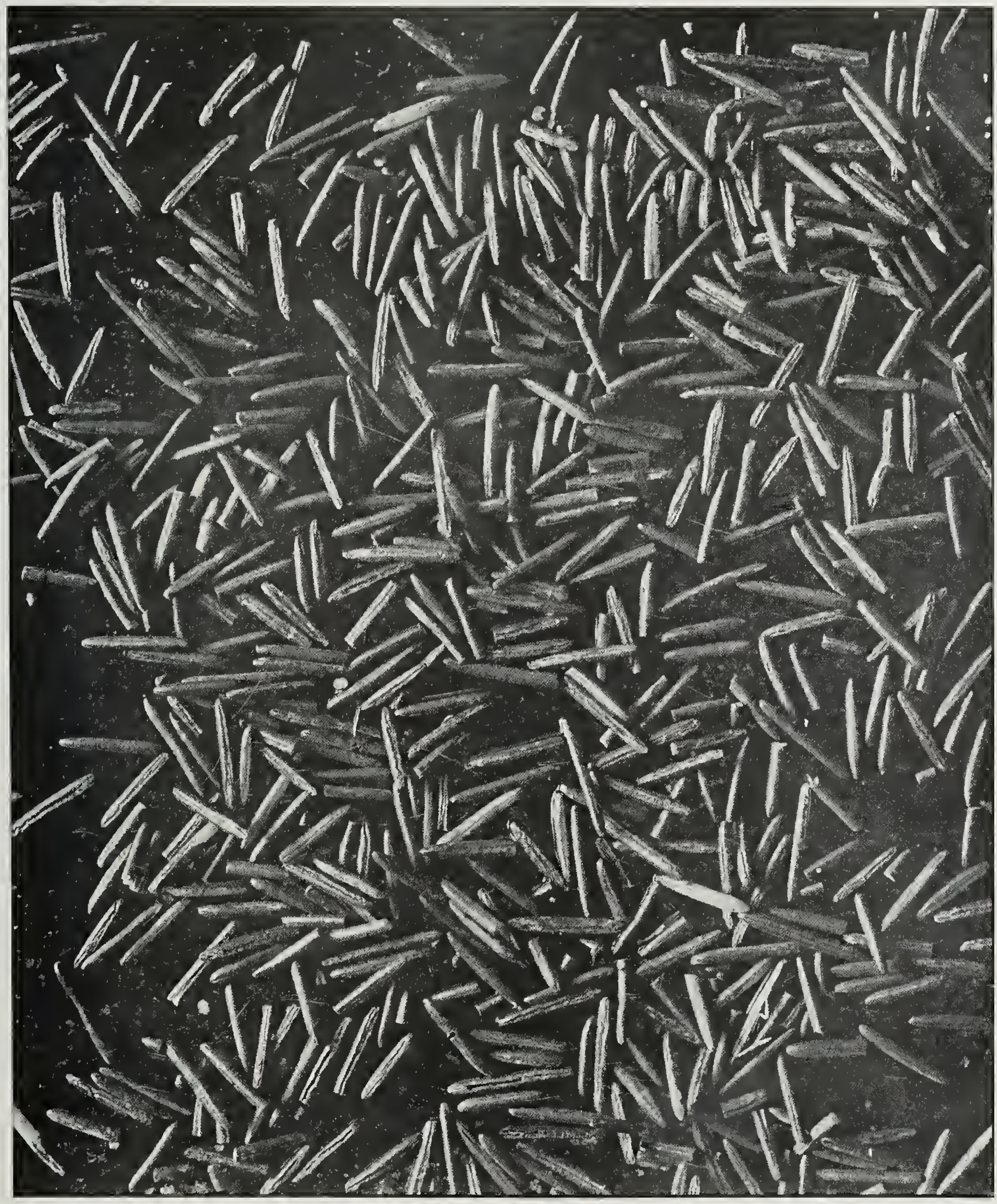
[1] Edward Tanner, Detroit Gazette, December 8, 1820.
[2] Motzfeldt, letter, December 3, 1898.



WILD-RICE KERNELS AFTER THRASHING AND WINNOWING

TABLE A—*Statistical view of wild-rice production*

[NOTE—Wild rice has no legal weight per bushel. Letters of inquiry to various reservations have resulted in the information that the weight of a bushel is 60, 38, 36, and 30 pounds. In some fields, as at Lac Courte Oreille river, Wisconsin, and Rat Portage, Ontario, the grain averages 50, 60, and at times 75 bushels per acre. There are some fundamental reasons why the following statistics do not tell the whole truth. Unless the Indian agent is personally interested in the natural production of the Indians he does not know accurately the amounts of wild rice which they produce. Agents' reports are frequently sent in before or during the harvest, in which case the amount of wild rice gathered is either only estimated or is not mentioned at all. Agents were frequently changed, and the new ones often did not speak of the rice crop in their first reports. Attention is also called to the utter lack of uniformity in making up the Indian Affairs Reports. The statistics which follow are sometimes given in the text and again in various tabulated forms. In some of the reports wild rice can not be distinguished from other rice or even other cereals which were produced.]

Indians	Year	Population	Rice		Value	Remarks	References
			Pounds	Bushels			
Ojibwa (Lake of the Woods), Canada	1852			2,000		About 100 families harvested	Pither, letter, Dec. 5, 1898.
Mississippi, Pillager, and Winnebigoshish Chippewa	1864	3,966		5,000	$25,000	See note *a*, p. 1078	Ind. Aff. Rep., 1864, p. 417.
Menomini (Green Bay agency)	1866	1,376		50	100		Ind. Aff. Rep., 1864, p. 363.
Chippewa (Ojibwa) of Lake Superior (Michigan agency).	1866	1,058		650	1,950		Ind. Aff. Rep., 1866, p. 363.
Mississippi band (Chippewa agency of Mississippi)	1866	2,166		4,000	16,000	"A fair yield"	Ind. Aff. Rep., 1866, p. 264.
Pillager and Lake Winnebigoshish (Chippewa agency of Mississippi).	1866	1,899		2,500	10,000	do	Do.
Red Lake Indians (Chippewa agency of Mississippi)	1866	1,183		500	2,000	do	Do.
Chippewa (Ojibwa) of Lake Superior	1867	1,060		1,000	2,000		Ind. Aff. Rep., 1867, p. 386.
Kickapoo (Kickapoo agency, Kansas)	1867	282		320	320		Ind. Aff. Rep., 1867, p. 383.
Chippewa (Ojibwa) of Lake Superior	1868	1,060		2,000	4,000		Ind. Aff. Rep., 1868, p. 364.
Chippewa (Ojibwa) of Saginaw	1868	1,555		1	2		Do.
Chippewa (Ojibwa) of Mississippi river	1868			1,000	4,000		Do.
Pillager and Lake Winnebigoshish Indians	1868			2,000	8,000		Do.
Do	1869			1,000	4,000		Ind. Aff. Rep., 1869, p. 479.
Chippewa (Ojibwa) of Mississippi river	1869			600	2,400		Do.
Do	1870			2,150	3,583		Ind. Aff. Rep., 1870, p. 342.
Seneca and others (New York)	1870			7,250	5,074		Do.
Menomini (Green Bay)	1870			30	150		Do.
Seminole agency (Indian Territory)	1870	2,136		50	500	See note *d*, p. 1078	Ind. Aff. Rep., 1870, p. 341.
Yakima reservation (Washington Territory)	1870	2,700		200	1,400	See note *b*, p. 1078	Ind. Aff. Rep., 1870, p. 336.

TABLE A—*Statistical view of wild-rice production*—Continued

Indians	Year	Population	Rice		Value	Remarks	References
			Pounds	Bushels			
Chippewa of Lake Superior (Bois Fort bands)	1871		20,000				Ind. Aff. Rep., 1871, p. 628.
Chippewa of Lake Superior, viz, Bad River, Red Cliff, Lac du Flambeau, Lac Courte Oreille, Fond du Lac, and Grand Portage bands.	1871	5,125	59,200				Do.
Chippewa of Lake Superior (Michigan)	1871	1,125		260	$1,105		Ind. Aff. Rep., 1871, p. 634.
Menomini (Green Bay, Wisconsin)	1871	1,348		30	150		Do.
Chippewa of Lake Superior (Michigan)	1872	1,195		1,220			Ind. Aff. Rep., 1872, p. 401.
Chippewa of Mississippi and other bands, as Pillager, Red Lake, etc.	1872	4,774		950			Do.
Menomini (Green bay, Wisconsin)	1872	1,362		200			Do.
Creeks (Indian Territory)	1872	13,000		500		See note *d*, p. 1078	Ind. Aff. Rep., 1872, p. 403.
Seminole (Indian Territory)	1872	2,398		500		do	Do.
Peah (near Denver, Colorado)	1872			60			Ind. Aff. Rep., 1872, p. 409.
Coos (Alsea subagency, Washington)	1872	110		200		See note *b*, p. 1078	Ind. Aff. Rep., 1872, p. 413.
Umpqua (Alsea subagency, Washington)	1872	40		50		do	Do.
Alsea (Alsea subagency, Washington)	1872	107		100		do	Do.
Menomini, Stockbridges, Munsee, Oneida	1873			300			Ind. Aff. Rep., 1873, p. 346, table.
Chippewa of Lake Superior (La Pointe agency)	1873			1,800			Do.
Chippewa of Lake Superior and other bands	1873	4,637		3,200			Do.
Seminole (Indian Territory)	1873			25		See notes *c* and *d*, p. 1078	Do.
Menomini, Stockbridges, Munsee, Oneida	1874			300			Ind. Aff. Rep., 1874, p. 122.
Chippewa of Lake Superior (La Pointe agency)	1874		30,000				Do.
Seminole (Indian Territory)	1874	2,438		25			Ind. Aff. Rep., 1874, p. 124.
Santee Sioux (Flandreau special agency on Missouri river, northern Nebraska).	1874	791		20		This report was made September 5, which was too early to know total amount.	Ind. Aff. Rep., 1874, p. 125.
Chippewa, Bad River band (Wisconsin)	1875	732	4,000			This crop exceeded 4,000 pounds	Ind. Aff. Rep., 1875, p. 371.
(Ojibwa) White Earth (Minnesota), Mississippi Pembina, and Ottertail Pillager bands.	1878	2,872		150		This report was dated August 30; crop was about 150 bushels.	Ind. Aff. Rep., 1878, p. 82.

Chippewa, Bad river (Wisconsin)	1878		10,000			Total harvest for the year was 146,000 pounds.	Ind. Aff. Rep., 1878, pp. 146, 311.
Chippewa (Wisconsin), Fond du Lac, Bois Fort, Grand Portage, Red Cliff, Bad River, Lac du Flambeau, and Lac Courte Oreille bands	1879	5,150	129,000				Ind. Aff. Rep., 1879, p. 163.
	1881			6,500		Total amount gathered	Ind. Aff. Rep., 1881, p. 308.
Menomini	1882	1,500		50			Ind. Aff. Rep., 1882, p. 364.
	1884			1,400		Total amonnt gathered	Ind. Aff. Rep., 1884, p. 320.
	1885				40	Total value of wild rice sold	Ind. Aff. Rep., 1885, p. 394.
Bad River reservation, Wisconsin	1898	1,200		200	per lb., 10 cts.	50 per cent of crop gathered	Patterson, letter, Dec. 5, 1898.
Fond du Lac reservation, Minnesota	1898	400		650	per lb., 6–10 cts.	41.3 per cent of crop gathered	Phalon, letter, Dec. 27, 1898.
Lac Courte Oreille reservation, Wisconsin	1898	1,150		500	per lb., 8–10 cts.	Could have gathered much more.	Rodman, letter, Nov. 11, 1898.
Nett Lake reservation, Minnesota (Vermilion Lake, Bois Fort).	1898	200		100	per lb., 7 cts.	do	Gheen, letter, Nov. 15, 1898.

The Indians at Bad river, Fond du Lac, and Lac Courte Oreille reservations harvested about the same amount of wild rice in 1899 as in 1898. A storm destroyed nearly the entire crop at Vermilion lake in 1899. The Menomini Indians annually harvest from 50 to 100 bushels, but the whites who own the land adjoining Shawano lake—their harvest ground—frequently forbid them to camp there; thus their crop is uncertain.

Note a—Estimates of other Indian productions for the year 1864

Commodities	Amounts	Value
Furs		$40,000
Maple sugar	150,000 pounds	15,000
Potatoes	3,000 bushels	3,000
Maize	1,000 bushels	1,500
Total		59,500

With wild rice valued at $25,000, as is given in Table A, it equaled 30.308 per cent of the total Indian production (Indian Affairs Report, 1864, p. 417).

Note b—*Zizania aquatica* has not been found west of the Rocky mountains; so this reference should be, probably, to *Avena fatua*, the indigenous wild oat of California and vicinity.

Note c—Several letters of inquiry sent to Indian Territory have met with no response. It is therefore impossible to state what grain this is, though it is believed to be *Zizania aquatica*.

Note d—The Seminole of Indian territory planted rice in 1873 (see Indian Affairs Report, 1873, p. 212). The same fact is suggested in the Indian Affairs Report for 1872.

This table shows, therefore, when all doubtful references to wild-rice production are disregarded, that, besides the Indians in the wild rice district, the following have produced the grain since 1852: The Kickapoo of Kansas; the Chippewa (Ojibwa) of Saginaw, Michigan; the Seneca and others of New York; the Santee Sioux of Nebraska, and the Peah Ute of Colorado.

It is regretted that no data could be obtained from the four reservations where wild rice is now produced in greatest quantities, viz, those of Red lake, Pine point, Wild Rice river, and White Earth agency, all in Minnesota.

Following is a list of Indian agencies at reservations where no wild rice grows, although the natives are within reach of what was once wild-rice territory, and many of them consumed the grain at an earlier period:

Lower Brulé agency, South Dakota.
Cheyenne River agency, South Dakota.
Crow Creek agency, South Dakota.
Pine Ridge agency, South Dakota.
Yankton agency, South Dakota.
Rosebud agency, South Dakota.
Sisseton agency, South Dakota.
Standing Rock agency, North Dakota.
Devils Lake agency, North Dakota.
Fort Berthold agency, North Dakota.
Mackinaw agency, Michigan.

TABLE B—*Value of wild rice per bushel*

[NOTE OF EXPLANATION—These values are obtained from Table A]

Year	Per bushel
1864	$5.00
1866	$2.00, 3.00, and 4.00
1867	$1.00 and 2.00
1868	$2.00 and 4.00
1869	$4.00
1870	$0.60, 1.20, 5.00, 7.00 and 10.00
1871	$4.25 and 5.00

The following table will aid in showing how long and how largely the Indians in the wild-rice district have been able to maintain themselves through natural production. Some idea may also be obtained

as to what part wild rice played in the Indian food supply by comparing a certain tribe of Indians in Table A with the same tribe in Table C at about the same year.

TABLE C—*Standard of life of the various Indians who have produced wild rice, being an estimate of the standard of subsistence obtained by Indian civilized labor, Indian natural labor, and Government assistance* [1]

	Indians	Year	Indian civilized labor	Indian natural labor	Government assistance
			Per cent	*Per cent*	*Per cent*
1	Creeks, Indian Territory	1875	100	....	....
2	Kickapoo, Kansas	1875	50	50	....
3	.....do	1881	90	10	....
4	Peah Ute, Colorado	1875	....	65	35
5	Chippewa of Lake Superior	1875	40	60	....
6	All Michigan Indians, including 5	1877	60	40	....
7	Chippewa of Lake Superior	1881	75	25	....
8	Chippewa of Mississippi, Pillager, and Lake Winnibigoshish	1875	5	95	....
9	Chippewa of Red Lake	1875	50	50	....
10	.....do	1877	50	50	....
11	All Leech Lake Indians, including 8 and 9	1877	40	60	....
12	Chippewa of Lake Superior, including 13 to 18	1875	40	60	....
	Chippewa of Lake Superior in following bands:				
13	Red Cliff	1881	65	35	....
14	Bad River	1881	60	40	....
15	Lac Court Oreille	1881	10	90	....
16	Fond du Lac (Lake Superior)	1881	60	40	....
17	Grand Portage	1881	50	50	....
18	Bois Fort	1881	50	50	....
19	Santee Sioux, Nebraska	1875	35	15	50
20	.....do	1877	40	20	40
21	.....do	1881	70	5	25
22	Menomini, Stockbridge, and Oneida of Wisconsin	1875	100	....	....
23	Menomini, Wisconsin	1881	90	10	....
24	Coos, Umpqua, and Alsea of Oregon	1875	25	75	....
25	Entire Siletz agency, including the three of 24	1881	65	12	23
26	Chippewa of White Earth agency, Minnesota, in the following bands: Mississippi, Pembina, Ottertail, and Pillager. (See 8)	1878	75	25	....
27	All Chippewa of Leach Lake, Red Lake, and White Earth agencies, including 8, 9, 10, 11, 26	1881	50	50	....

[1] These figures are found in the Indian Affairs Reports for 1875, p. 122 et seq.; for 1877, p. 311 et seq., for 1878, p. 305, and for 1881, p. 290 et seq.

Chapter V

CONSUMPTION

Nutrition

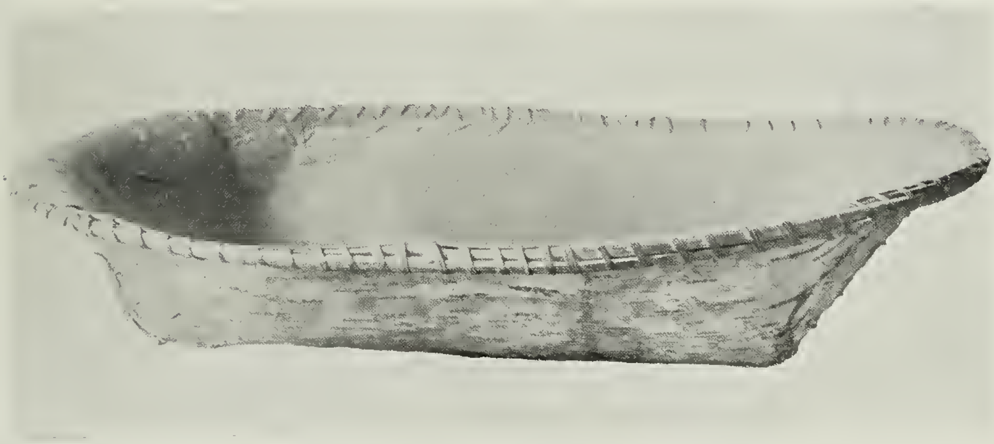
Of the various authors quoted in this memoir not one has spoken disparagingly of wild rice as a food. A few have observed that it is nearly as good as the white rice of commerce; a great many have said that it is fully as good, while still many others have said that it is better. A few of these observations will be presented later, when the various ways of preparing the grain for food are considered.

In 1862 Mr Ed. Peters made a chemical test of the composition of the grain (*Zizania aquatica*), and Prof. F. W. Woll, chemist of the Agricultural Experiment Station at Madison, Wisconsin, made a similar test for this memoir in 1899. These are the only tests which have been reported, and it is upon them that the positive statements of the nutritive qualities of wild rice are made. The following table (D), column *h*, shows that wild rice is more nutritious than the other native foods to which the wild rice producing Indians had access, viz, maize, green corn, corn meal, white hominy (substitute for Indian hominy), strawberries, whortleberries, cranberries, sturgeon, brook trout, and dried beef (substitute for dried or jerked buffalo meat). It shows also that it is more nutritious than any of our common cereals, as oats, barley, wheat, rye, rice, and maize.

It is noticed that the wild rice is very rich in nitrogen-free extract; that is, carbohydrates, such as starch, sugar, etc., which are heat producers. In the economy of the animal body they are transformed into fat. They thus produce both heat and fat. Indeed, wild rice is seen to be richer in carbohydrates than any other of the foods here mentioned, with the exception of white hominy—the hominy of commerce.

The last two specimens of wild rice mentioned in Table D were produced by Indians and came from Lac Courte Oreille reservation, Wisconsin, while the first specimen probably was not, as the Indians do not consume the grain in the "original substance," and the "dried substance," by Peters, is drier than the Indians prepared it—the water having been entirely removed. It is also noticed that the Indian-produced wild rice is very rich in crude protein, or the albuminoids,

A, BIRCH-BARK MOCOCKS IN WHICH THE GRAIN IS CARRIED



B, BIRCH-BARK WINNOWING TRAY

TABLE D—*Composition of cereals and Indian foods*

Cereals and Indian foods	(*a*) Water	(*b*) Ash (mineral matter)	(*c*) Crude protein (albuminoids, flesh producers)	(*d*) Crude fiber (celulose)	(*e*) Nitrogen-free extract (carbohydrates, starch, sugar, etc)	(*f*) Ether extract (fat or oil)	(*g*) Nitrogen	(*h*) Total nutrition (the product of columns *c*, *e*, and *f*)
Wild rice:								
In der ursprünglichen substanz[1]—	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Haferreis geschält[2]	12.00	1.70	6.74	1.93	76.93	0.70		
Samenschale[2]	13.20	9.20	2.82	38.90	35.05	.83		
In der trockeneu substanz[1]—								
Haferreis geschält[2]		1.95	7.74	2.22	87.29	.80	1.24	
Samenschale[2]		10.60	3.25	44.81	40.38	.96	.52	
The original substance (the entire grain)	12.14	2.60	6.269	6.36	71.90	.715		
The dried substance (the entire grain)		1.98	7.20	7.33	81.66	.819	1.15	[3] 89.679
Smoke dried (the entire grain)	9.99	1.58	13.65	1.22	72.68	88		[3] 87.21
Parched (the entire grain)	9.54	1.44	13.00	1.12	74.04	.86		[3] 87.90
Corn (maize)[4]	10.9	1.5	10.5	2.1	69.6	5.4		85.5
Green sweet corn[5]			2.8		14.2	1.1		18.1
Corn meal[5]			9.2		70.6	3.8		83.6
White hominy[5]			8.3		77.4	.4		86.1
Strawberries[5]			1.0		6.9	.7		8.6
Whortleherries[5]			.7		13.5	3.0		17.2
Cranherries[5]			.4		10.9	.9		12.2
Sturgeon, section of[6]			15.4			1.6		17.0
Brook trout, whole[6]			9.8			1.1		10.9

[1] Peters in Dietrich und König Futtermittel, Zweite Auflage, I (Berlin, 1891), p. 585.

[2] Note in Dietrich . . . , p. 585: "Kern und Schale waren in dem Gewichtsverhältniss von 88:12 vorhanden." In order to get the composition of the entire grain, or the grain as the Indian consumed it, the first, "Haferreis geschält," is multiplied by 88, and the second, "Samenschale," by 12, and the product is divided by 100.

[3] In comparing the nutrition of wild rice and cleaned rice, it must be noticed that the wild rice grain is yet inclosed in its pellicle, while the cleaned rice has had the pellicle removed. If the wild rice were "cleaned" by having its pellicle removed it would be still more nutritious.

[4] Test of Professor F. W. Woll, Experiment Station, Madison, Wisconsin.

[5] Report of Connecticut Board of Agricultural and Experiment Station 1891, table 33

[6] Ibid., table 32.

Table D—*Composition of cereals and Indian foods*—Continued

Cereals and Indian foods	(*a*) Water	(*b*) Ash (mineral matter)	(*c*) Crude protein (albuminoids, flesh producers)	(*d*) Crude fiber (celulose)	(*e*) Nitrogen-free extract (carbohydrates, starch, sugar, etc)	(*f*) Ether extract (fat or oil)	(*g*) Nitrogen	(*h*) Total nutrition (the product of columns *c*, *e*, and *f*)
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
White-fish, whole[1]	......	......	10.3	......	......	3.0	......	13.3
Lake trout, whole[1]	......	......	7.7	......	......	5.4	......	13.1
Dried beef[2]	......	......	28.8	......	1.4	4.4	......	34.6
Oats[3]	11.0	3.0	11.8	9.5	9.5	5.0	......	76.5
Barley[3]	10.9	2.4	12.4	2.7	69.8	1.8	......	84.0
Wheat[3]	10.5	1.8	11.9	1.8	71.9	2.1	......	85.9
Rye[3]	11.6	1.9	10.6	1.7	72.5	1.7	......	84.8
Rice, cleaned[4]	......	......	6.73	......	78.48	.88	......	86.09

[1] Report of Connecticut Board of Agricultural and Experiment Station 1891, table 32.
[2] Ibid., table 33.
[3] Test of Professor F. W. Woll, Experiment Station, Madison, Wisconsin.
[4] Austin, Rice . . . , p. 11.

which produce flesh. It is richer in flesh-producing substance than any of the other foods given above, with the exception of sturgeon and dried beef. It is therefore true that wild rice is the most nutritive single food which the Indians of North America consumed. The Indian diet of this grain, combined with maple sugar and with bison, deer, and other meats, was probably richer than that of the average American family to-day. Of course this diet lasted a limited part of the year only.

Ways of Preparing Wild Rice for Food

Food suggests plenty and satisfaction. The witty and humorous after-dinner speeches of well-dined and well-wined men are a natural overflow. Radisson presents a brief glimpse of a happy primeval banquet before the western Indian had learned to distrust the white man. He speaks of a friendship feast of the Dakota as follows: "Our ſongs being finiſhed, we began our teeth to worke. We had there a kinde of rice, much like oats . . . and that is their food for the moſt part of the winter, and [they] doe dreſſe it thus: ffor each man a hand-full of that they putt in the pott, that ſwells ſo much that it can ſuffice a man."[1]

The Indian is very fond of soups, and wild rice is commonly used by him to thicken food of this kind quite as commercial rice is used by the whites. Early in the eighteenth century Neill wrote of the Dakota Indians: "Wild rice is a good and very healthful food, very light and nourishing; it is excellent with game broth."[2]

On the same page this author also said that at the time these Indians buried their store of grain in the fall of the year, "they also put some to rot in the water, and when they return in the spring they find it delicious." Ellis wrote of the use of wild rice in the early days at Green bay, Wisconsin, as follows: "It is used to thicken their broth of venison, bear, fish, and fowl; it is very nutritious and palatable."[3] The wild rice of the Mississagua Indians of Rice lake, Ontario, is parched and "without further preparation it is often used by hunters and fishermen when out on expeditions. But more frequently it is made into soup and stews."[4] From Lake of the Woods comes a receipt for a wild-rice dish, which suggests a delightful flavor, as follows: "A soup made of wild rice and blue berries is a very palatable dish, and eagerly sought after by those who have been living on salt food for several weeks."[5] The Potawatomi Indians, after pounding their grain, hull and all, and throwing it into a vessel of water, skimmed off the refuse hulls and made the remainder into a very palatable soup.[6]

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[1] Radisson, Voyages . . . , p. 215.
[2] Neill, Memoir of the Sioux, p. 236.
[3] Ellis, Recollections, p. 266.
[4] Chamberlain, op. cit., p. 155.
[5] Hind, Narrative, pp. 96–97.
[6] Paddock, letter, January 20, 1899.

Some of the dishes of which wild rice forms a part, however, are not so suggestive of satisfaction to the palate of the white man; and yet, most white people have eaten food less palatable than a stew or soup of wild rice and dog meat, notwithstanding its suggestiveness. It is a favorite dish with the Indian. After some of the customary conflicts between the Ojibwa and Dakota in the wild-rice district, the following was recorded in 1840: "The savage party [Ojibwa] also cooked some of the flesh of the Sioux with their rice."[1] The Sandy lake Indians, according to Doty, have boiled the excrement of rabbit with their rice to season it, and they esteem it a luxury. To make this dish still more palatable—in fact, one of their highest epicurean dishes—they occasionally took a partridge, and, after having picked off its feathers, but made no further preparation, they pounded it to the consistency of jelly. It was then thrown into the dish and the whole was boiled.[2]

The following dish is not only palatable, but also very nutritious: "The Indian women used to make a favorite dish of wild rice, corn, and fish boiled together, and called *Tassimanonny*. I remember it to this day as an object of early love."[3] Marquette wrote that after winnowing the grain "they pound it to reduce it to meal, or even unpounded, boil it in water seasoned with grease, and in this way, wild oats [wild rice] are almost as palatable as rice would be when not better seasoned."[4] Traill wrote of the Indians about Quinto bay, Ontario, as follows: "That night . . . cooked some of the parched rice, Indian fashion, with venison, and they enjoyed the novelty very much. It made an excellent substitute for bread, of which they had been so long deprived."[5]

The cooked grain is eaten plain, and is also a great favorite with the Indian when eaten with sweets, especially with maple sugar. Schoolcraft tells us that it was boiled in water to the consistency of hominy and was eaten, unseasoned, with spoons. It is also sometimes roasted and eaten dry. He stated that it contains more gelatinous matter than the southern rice, and is very nutritious.[6] Hennepin said that the Indians used to boil their rice except during the time of hunting. "Les Sauvages en font leur provifion pour fubfifter une partie de l'année en la faifant cuire en maniere de bouillie hors du temps de leur Chaffe."[7] Flint wrote "The grain, that we have eaten, was as white, as the common rice. Puddings made of it tasted to us, like those made of sago."[8] Carver stated that the Dakota "boil it and eat it alone"; that they also

[1] Neill, The Beginnings of Organized Society, p. 64.
[2] Doty, Wisconsin Historical Collections, vol. VII, p. 199.
[3] Biddle, Wisconsin Historical Collections, vol. I, p. 63.
[4] Shea, Discovery, p. 9.
[5] Traill, Canadian Crusoes, p. 185.
[6] Schoolcraft, Indian Tribes, vol. III, p. 63.
[7] Hennepin, Nouvelle Decouverte, p. 313* (fol. 0*4).
[8] Flint, Geography and History, vol. I, p. 85.

eat their meat and usually their maple sugar alone.[1] Le Sueur spoke of two features of the feasts of the Dakota. He was invited to their wigwams, and, after their customary weeping ceremony "the chief offered him wild rice to eat, and according to their cuftom put the firft three fpoonfuls in to his [own] mouth."[2] The "Mandantons" (Dakota band) invited him to a great banquet where there were 100 men, each with his plate.[3]

Hennepin and his companions were captured and adopted into Dakota families; after pipe smoking, in the ceremony of adoption, the principal chief gave them wild rice, presenting it on birch-bark dishes. The women had seasoned the food with sun-dried whortleberries. He said that they were as good as currants—"ces Barbares nous donnérent à manger de la folle avoine, dont j'ai fait mention. Il nous la prefentérent dans de grands plats d'écorce de bouleau. Les femmes Sauvages l'avoient affaifonnée avec des bluez. Ce font des graines noires, qu'elles font fecher au Soleil pendant l'été, & qui font auffi bonnes que des raifins de Corinthe."[4] He was also given wild rice with the smoked roe of fishes—"Aquipaguetin, qui m'avoit adopté, ne me donnoit qu'un peu de folle avoine cinq ou fix fois la femaine avec des oeufs de poiffons boucannez pour me nourir. Les femmes faifoient cuire tout cela dans des pots de terre."[5] Dablon said, "et la graisse mélée avec la folle avoine, fait le mets le plus delicat de ce païs."[6] This was among the Maskotin.

Hoffman wrote in 1892 that the Menomini Indians boiled their rice and ate it plain with maple sugar. It was also sometimes boiled with meat or vegetables, or a broth was made of it and was served as soup.[7] Mr George Lawe wrote of these Indians in the early forties that their rice when boiled and eaten with maple sugar is very palatable and nutritious, and serves them instead of breadstuffs.[8] Reverend Chrysostom Verwyst, a lifelong missionary among the Indians south of Lake Superior, says: "Wild rice is very palatable, and the writer and his dusky spiritual children prefer it to the rice of commerce, although it does not look quite so nice."[9]

The Indians at Lac Courte Oreille reservation, and doubtless all other wild rice producing Indians, will eat the grain cooked in any form in which they are able to procure it. During the three weeks following the harvest of 1899 I was daily, almost constantly, in their houses, wigwams, war-dance circle, and Midē' society lodge, and did not witness a meal in which wild rice was not consumed. In fact, during the eight days covered by their dances, when I saw them eat three or four times daily, wild rice, cooked in a manner similar to

[1] Carver, Travels, p. 262.
[2] Shea, Early Voyages, p. 107.
[3] La Harpe, Journal, p. 66.
[4] Hennepin, Nouvelle Decouverte, p. 347.
[5] Ibid., p. 355.
[6] Relations des Jésuites, 1671, p. 44.
[7] Hoffman, Menomini Indians, p. 291.
[8] Indian Affairs Report, 1843, p. 434.
[9] Verwyst, Historical Sites of Chequamegon Bay, in Wisconsin Historical Collections, vol. XIII, p. 429.

oatmeal, and eaten alone, was their entire diet nearly every meal. At times also the rice was used to thicken venison and dog stew.

The white people near all the reservations in Wisconsin and Minnesota, where wild rice is produced are, as a rule, very fond of the food. As a result of many personal interrogations I believe that fully 90 per cent of the white people who have eaten wild rice are fond of it.

Both the Indians and the whites wash the grain three or four times before cooking. Sometimes a small quantity of soda is added to the water used in the first washing. The green wild rice will cook by simply having boiling water poured over it. The parched wild rice needs to be cooked about half an hour, while the fire-cured or black wild rice requires nearly an hour for cooking. When it is cooked like oatmeal twice as much boiling water as rice is used. The grain cooked in this manner may be warmed over, and its flavor and wholesomeness in no way impaired. In cooking it swells probably a little less than commercial rice, but a coffee-cup full, measured before cooking, will furnish a full meal for two Indians, or sufficient breakfast food for eight or ten persons. The grain is especially wholesome as a breakfast food served with sugar and cream; and when treated in any way with wild game, whether as a dressing, in soups or stews, or as a side dish dressed with the juices of the game, it is at its best, and is delicious and wholesome.

John Long wrote of a baby food in which wild rice was the most important ingredient. He said that the northern Indian women fed their little children on rice and oats, which, when cleaned from the hull, were pounded between two stones, and boiled in water with maple sugar. "This food is reckoned very nourishing, and with broth made from the flesh of animals and fish, which they are frequently able to procure, can not fail of supporting and strengthening the infant."[1] Hunter, who was a captive among the Osage Indians from childhood until the age of 19 years, in the first quarter of the present century, says of their treatment of cholera morbus: "They resort to the steam-bath and cathartics, after which they give copiously of a gruel made of wild rice, and wild licorice tea. They also apply fomentations to the stomach."[2]

Periods of Consumption

The subject of mealtime is still open to study. Why it is that people of one nation have three meals regularly every twenty-four hours, while others have five, is a matter for sociologic speculation. As habits of industry become more fixed and the food supply comes more under control, mealtime correspondingly tends to become more regular.

[1] Long, Voyages and Travels, p. 61.
[2] Hunter, Captivity Among the Indians, p. 433.

During the period when the food supply depended upon almost constant effort, meals were partaken of whenever the individual could obtain food.

In this section will be brought together some facts as to the time of day and year when wild rice is consumed. It is natural to expect that most of it will be eaten immediately after harvest, for the Indian does not often save in large quantities or for a long period, especially in the case of food that he relishes greatly. However, since the fall hunts begin soon after the harvest, wild rice is generally quite extensively saved by those Indians whose hunting grounds are fruitful.

Hunter says of the Osage Indians: "The usual times of taking their meals, are at sunrise, noon, and sunset." When the days are long and the food abundant, the grown people eat three meals daily, when the days are shorter but two meals are eaten, and when food is scarce they eat but one, and sometimes not even that.[1] According to Schoolcraft the Dakota Indians have no regular mealtime.[2]

Pokagon, the late Potawatomi chief from the St Joseph river valley, Michigan, wrote in regard to this subject: "Indians eat when hungry." His people ate their rice in the fall and all the year if it lasted.[3] The Leech Lake Indians, in 1863, garnered their wild rice for use in midwinter, when other food could not be obtained.[4] In 1843 the Menomini stored their wild rice in the ground "to be taken therefrom, and used, during the winter, as their necessities require. In times of scarcity of game, they subsist entirely upon it."[5] Radisson says that wild rice is the food of the Dakota "for the moft part of the winter."[6]

Pike wrote of the "Minowa Kantongs" (the Mdewakaⁿtoⁿwaⁿ band of the Dakota) that they cultivated a small quantity of maize and beans, but, although he was with them in September and October, he never saw one kettle of either, as they always used wild rice for bread. This production, he said, nature has furnished to all of the most uncultivated tribes of the Northwest, so that they may gather enough, which, together with the products of the chase and the net, will insure them subsistence throughout the entire year.[7]

Of the wild-rice district in 1820, we read: "A few provident Indians save a little [wild rice] for the spring of the year to eat with their sugar, though generally by the time they have done curing it, the whole is disposed of for trinkets and ornaments." The author continues: "Thus by gratifying their vanity, they are left nearly destitute of provisions for the winter—choosing rather to endure hunger and the greatest misery, than to mortify their pride."[8]

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[1] Hunter, Captivity, pp. 259–260.
[2] Schoolcraft, Indian Tribes, vol. IV, p. 67.
[3] Pokagon, letter, November 16, 1898.
[4] Indian Affairs Report, 1863.
[5] Ibid., 1843, p. 434.
[6] Radisson, Voyages, p. 215.
[7] Coues, Pike, vol. I, p. 344.
[8] Edward Tanner, Detroit Gazette, December 8, 1820; reprinted in Wisconsin Historical Collections, vol. VII, p. 199 et seq.

Warren says that in 1862 the Ojibwa of Leech lake, Minnesota, gathered sufficient wild rice for winter consumption.[1] Carver wrote that the Indians saved the grain for an entire year. He speaks of the sacks of fawn skins and young bison skins "wherein they preserve it till the return of their harvest."[2] In 1775 Alexander Henry wrote of obtaining wild rice from the Indians in Canada, immediately north of the wild-rice district in the United States, about ten months after their last harvest.[3]

Letters of inquiry sent to reservations on which Indians now use wild rice elicited no new facts as to the time of its consumption. The grain is very highly esteemed as a food, and is usually eaten at any and all meals until the supply is exhausted.

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[1] Warren, History of the Ojibways, p. 186.
[2] Carver, Travels, p. 524.
[3] Henry, Travels, pp. 241, 243, 244, 251.

Chapter VI

GENERAL SOCIAL AND ECONOMIC INTERPRETATIONS

The Wild-rice Moon

With primitive man, as with wild animals, there are two chief foci from which radiate the primary activities of the individual and his society. Both are connected with the processes of growth. The one is food getting, the other reproduction. Along these radiations the majority of life's battles are fought—along those from the first focus the individual struggles to survive; along those from the second he struggles that others may survive, that he may perpetuate his species. In the evolution of animal life these struggles may be classified roughly as, first, purely chemical; next, predominantly instinctive, and last, conscious. Attention is called to the struggle along the radiations from the food focus, and in this last, or conscious stage.

The most fundamental and persistent want of man is that for food. It is not to be wondered at, therefore, that periods of food plenty should be recognized and marked conspicuously by suitable names. It is a worldwide custom of primitive people to name many months or moons of the year after that natural product which, by its abundance or usefulness, or by other means, emphasizes itself for the time being above all other products. Wild rice at the time of its harvest is such a product, and it has given name to its harvest moon among many wild rice producing Indians. In the Ojibwa language the September moon is called *Manominike-gisiss* or *Manomini-gisiss*, "the moon of the gathering of wild rice."[1] Schoolcraft gives the synonym *Mon-o-min-e-geez-is*, or "moon of wild rice,"[2] as referring to the August moon. There need be no discrepancy here, for the harvest occupied parts of August, September, and October. Wilson gives *muhnoomene-keezis*, "the wild rice moon," as another synonym for September.[3] In the Ottawa language, *Menomonie-ka-we kee-zis*, and in the Menomini language, *Pohia-kun ka-zho*, both mean "wild-rice-gathering moon."[4] The Potawatomi Indians have a moon called *manominike-gises*, or "the moon of gathering wild rice,"[5] corresponding with late September and early

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[1] Baraga, Dictionary.

[2] Schoolcraft, Indian Tribes, vol. v, p. 569.

[3] Wilson, Manual of the Ojebway Language. Both Wilson and Baraga call August the bilberry or whortleberry moon.

[4] Tanner, Narrative, p. 321.

[5] Pokagon, letter, November 16, 1898.

October. All of these synonyms, except that in the Menomini language, are clearly from the same root terms, viz, *mano'mĭn*, wild rice, and *keezis* or *gisiss*, moon or month.

In the language of the Dakota Indians, two moons, roughly corresponding to our September and October, have received their names from wild rice. September is called *Psin-na-ke-tu-wee*, or "the ripe-rice moon," and October is designated *Wa-zu-pee-wee*, or *Wee-wa-zu-pee*, "the moon when wild rice is gathered and laid up for winter."[1] Neill[2] gives the following synonyms for the same months: September is *Psinhnaketu-wi*, or "the moon when rice is laid up to dry," and October is *Wi-wajupi*, or *Wazupi-wi*, "the drying-rice moon." As early as 1828 Beltrami[3] cited the names for these two months. One of the words given by him is clearly a synonym of the above and the other is apparently so. As this author is an Italian it is easy to see that the difference may be due largely to spelling. However, he confused the words and called September *Wasipi-oui*, "the moon of oats," and October *Sciwostapi-oui*, "the second moon of oats." Long gives *Wajopi we* or "commencement of wild rice" as the name for September; and *Siushtaupl we* or "end of wild rice" as the name for October.[4] *Wewakikshoo* is also given as meaning "the moon when the wild rice is ripe."[5]

Thus, with the three great branches of the Algonquian stock in the district of the upper lakes—the Ojibwa, Ottawa, and Potawatomi—the autumnal harvest of wild rice was so important an event that at least one month was named from it. This is true also of the smaller tribe of the same stock, the Menomini, while the Dakota, of the Siouan stock, were so influenced in their household economy by this grain that two of their autumn months bear its name.

Wild Rice in Indian Ceremony and Mythology

The mythology of primitive people is usually an attempted explanation of phenomena, and for the purposes of comparison much credit may be attached to it. The following facts have been collected which show at what relative periods some of the Indians came into possession of wild rice. The first totem of the Menomini Indians was the Bear; consequently Bear is the name of the chief phratry. This bear came from the earth at Minikanisepe (Menomini river) between the upper peninsula of Michigan and Wisconsin, where the Bear phratry long resided. The second totem was the Eagle, which was at the head of the Big Thunder phratry, dwelling at Lake Winnebago. The Good Mystery made this phratry the laborers; they also brought rain.

[1] Gordon, Winona, p. 134, note.

[2] Neill, History of Minnesota, p. 86.

[3] Beltrami, Sources of the Mississippi, ii, p. 274.

[4] Long, Narrative, vol. I, p. 422.

[5] Atwater, Indians, p. 170. This author says that the "Dacotas reckon time by lunations," but he mentions only seven months.

The Good Mystery gave them maize, and they were also the makers of fire. They visited the Bear phratry, offering maize and fire in exchange for wild rice, which was the property of the Bear and the Sturgeon, and which grew abundantly along Menomini river. The bargain was concluded, and since that time the Bear and the Big Thunder phratries have lived together.[1] The Potawatomi of St Joseph river, Michigan, have a similar tradition. The Bear phratry gave maize and fire in exchange for wild rice.[2] The Winnebago say that the "Great Spirit" gave maize and wild rice to one man at the same time.[3] From the above, and from other facts known about these Indians, it seems plain that the Menomini came into possession of wild rice relatively early—that is, before the complete organization of the tribe—while the Potawatomi and the Winnebago obtained it at a much later time.

The periods of the wild-rice harvest, as indeed of most opportunities for social gatherings, are gala days to the Indians. Social pastimes and religious ceremonies are strangely commingled. Some of the ways in which the Indians express themselves at the rice harvest are here given, and others are presented which wild rice seems to characterize more or less distinctly. The Indians of White Earth reservation, Minnesota, give a rice feast. "The Manomin (wild rice) feast comes in the fall after gathering rice and before the winter hunt. It is a sort of thanksgiving, and prayers are offered to Manitou."[4] The Ojibwa Indians in Canada, about Lake of the Woods, perform the following ceremony: "Before commencing to gather the rice they make a feast, and none are allowed to gather the grain till after it. They thank the Master of Life for the crop, asking him to keep off all storms while they are harvesting."[5] The first fruits gathered by the Dakota "are set apart for the purpose of a spiritual or holy feast; the first corn or wild rice of the season, the first duck or goose killed when they appear in the spring, are all reserved for the feast, at which those Indians only who are entitled to wear the badge of having slain an enemy, are invited."[6] Tanner, who spent all his life with the Ojibwa, continually speaks of such feasts. At the sacred dog feast on the White Earth reservation the Ojibwa Indians usually kill and stew a dog in rice; certain ceremonies, including a dance, are then performed, after which the dog is eaten.[7] Mr Long wrote of the "Poes" (Potawatomi) that they compelled their prisoner, Mr Ramsey, of the American Fur Company, to eat his death feast at the war kettle

[1] Hoffman, The Menomini Indians, Fourteenth Annual Report of the Bureau of Ethnology, part 1, p. 40.
[2] Pokagon, letter, November 16, 1898.
[3] Information from the Winnebago near Elroy, Wisconsin, winter of 1898–99.
[4] Eleventh Census of the United States; Indians, p. 346.
[5] Pither, letter, November 18, 1898.
[6] Lockwood, Early Times and Events in Wisconsin, appendix 6, pp. 98–196, in Wisconsin Historical Collections, vol. II, p. 181.
[7] Eleventh Census of the United States; Indians, p. 346.

before he was to be tortured. The feast "consisted of dog, tyger-cat, and bear's grease, mixed with wild oats [wild rice]."[1]

Carver gives an account of a unique rice feast among the "Naudowessies" (Dakota). They paid uncommon respect to one of their women, and "They told me that when fhe was a young woman, for at the time I faw her fhe was far advanced in life, fhe had given what they termed a rice feaft. According to an ancient but almoft obfolete cuftom . . . fhe invited forty of the principal warriors to her tent, where having feafted them on rice and venifon, fhe by turns regaled each of them with a private defert, behind a fcrene fixed for this purpofe in the inner part of the tent." . . . "So fenfible were the young Indians of her extraordinary merit, that they vied with each other for her hand, and in a very fhort time one of the principal chiefs took her to wife." . . . "It is however fcarcely once in an age that any of their females are hardy enough to make this feaft, notwithftanding a hufband of the firft rank awaits as a fure reward the fuccefsful giver of it; and the cuftom, I fince find, is peculiar to the Naudoweffies."[2] The rice was used probably because it was the greatest delicacy which could be set before guests. Yet it seems to have been the kind of food which always characterized this extraordinary social function.

As might be expected from the meaning of their name, the Menomini Indians are more deeply influenced by wild rice than are other wild rice producing Indians. Special investigation[3] has proved, according to Indian traditions, what the facts recently given from Dr Hoffman's report seemed clearly to show, i. e., that the Menomini came into possession of wild rice at the very inception of their tribal organization. Mä'näbush, one of the numerous mythic half-god half-man personages of the myths of the Menomini Indians, created the bear, which came out of the earth at Menominee river (between the upper peninsula of Michigan and Wisconsin). Mä'näbush determined to make an Indian of the bear, and accomplished the feat at the end of four days. He called the Indian "Shekatcheke'nau," and made him the head of the Bear phratry, the first phratry of the Menomini tribe. Then taking the Indian to the river he showed it to him and gave it into his hands, with all its fish, its great beds of wild rice, and many sugar trees along its banks. He said, "I give these things to you, and you shall always have them—the river, the fish, the wild rice, and the sugar trees." Shekatcheke'nau answered, "I thank you. It is all right. I will always work for you."

In a short time Wĭshki'no, the eagle, the thunderer, came from lake Winnebago to visit at Menominee river. He became the head

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[1] Long, Voyages and Travels . . . p. 146.

[2] Carver, Travels, pp. 245, 246. This paragraph, and other matter from this author, is given purely on Carver's authority; he is not so reliable on Indian subjects as could be desired, and this account of the rice feast savors strongly of the fabulous.

[3] Information from Menomini, at Menomini reservation, in the autumn of 1899.

of the Big Thunder phratry, the second phratry of the Menomini tribe. The world mission of this eagle, whom Mä'näbush had also changed into an Indian, was to bring rain, and fire, and maize to men. When Shekatcheke'nau saw the eagle, he said, "I am glad to receive you. You will always stand by me. You will always be my warrior. You see everything—the river with fish, the beds of wild rice, everything—I turn all of these over to you." When the wild rice was ripe in the fall, the eagles, all decorated with feathers, had their canoes and rice sticks ready. After they had gathered four canoe loads, a thunderstorm came. It destroyed all of the grain which had not been gathered, and spoiled the beautiful feathers on the heads of the eagles. Then Wĭshki'no said to Shekatcheke'nau, "It won't do for you to give me the wild rice, for wherever I go there is thunder, and wind, and rain. I will give it all back to you, and you'd better control it always." So after that when rice harvest came Shekatcheke'nau called all of his people together, and they made a feast, and smoked, and asked the Great Spirit to give them fair weather during the harvest. Since then there has always been a fine, stormless harvest season.

It is remembered that Mä'näbush told Shekatcheke'nau that he would always have wild rice. This fact has so influenced the Menomini Indians that they will not sow the grain. If the Great Spirit wants them to have it, it will grow of itself. According to their traditions, when the tribe moved from Menominee river to Lake Winnebago and vicinity, no wild rice grew there, but it soon came to supply their wants; Lake Poygan even being named by them. It is called "Po-wa-hĕ'-cännĕ" or "threshing [or] striking [wild rice]." Mr Gauthier, who was government interpreter for over forty years among the Menomini, said, in 1899, that the Indian agent who removed the tribe in 1852 from the vicinity of Lake Winnebago to their present reservation, desired them to gather wild rice and sow it in their new home. At each council he sought to induce them, but they unanimously refused. Nio'pet, the very intelligent chief of the tribe, says that when they came to their present home, wild rice grew only in scattering stalks in Shawano lake. In about ten years it was plentiful, and has been their annual harvest field since. He also says that it has nearly died out in the vicinity of Lake Winnebago, where previously they gathered it in great quantities. Then the old chief asked "Why?" and smiled satisfiedly as though he knew.

Among the Ojibwa of Wisconsin wild rice is frequently spoken of in folktales. Generally it does not characterize these stories, but is mentioned as any other natural product might be. However, two tales were found among the Wenibojo' stories at Lac Courte Oreille reservation which explain the discovery of wild rice. Wenibojo', the mythic personage of the Ojibwa Indians (the same as Mä'näbush

of the Menomini), made his home with his grandmother, Noko'mĭs. One day the old woman told him that he ought to prove himself a manly fellow; he ought to take a long journey through unknown forests; he ought to go without food and get accustomed to the hardships of life. So Wenibojo' told her that he was going away, that he was going to fast; and taking his bow and arrows he wandered out into the forest. Many days he wandered, and finally came to a beautiful lake full of wild rice, the first ever seen. But he did not know that the grain was good to eat; he liked it for its beauty. He went into the forest and got the bark from a large pine tree. From this bark he made a canoe with which to gather the grain. After the canoe was made, he went to Noko'mĭs, and they both came and gathered the rice, and sowed it in another lake. He then left Noko'mĭs by this lake of sowed wild rice, and, taking his bow and arrows, started away again into the forest. As he wandered along some little bushes spoke to him and said: "Sometimes they eat us." Wenibojo' at first paid no attention to the address, but finally he said: "Who are you talking to?" On being told that he was the one addressed, he stooped down and dug up the plant. He found a long root, as long as an arrow. It tasted very good to him, so he dug and ate a great many of the roots. He ate so many that he became sick, and lay there three days too ill to move. When finally he got up, he wandered on. He became very faint and hungry; other plants spoke to him, but he was afraid to eat them. At last he was passing along the river, and saw little bunches of straw growing up in the water. They spoke to him and said: "Wenibojo', sometimes they eat us." So he picked some of it and ate it, and said: "Oh, but you are good! What do they call you?" "They call us mano'mĭn [wild rice]," the grass answered. Wenibojo' waded out into the water up to his breast and beat off the grain, and ate and ate, but this time he was not sick. Finally he remembered the wild rice which he and old Noko'mĭs had sown, so he returned home to his mano'mĭn lake.

The other tale of the origin of wild rice is taken from a series of experiences of Wenibojo'. One evening he returned from hunting, but he had no game. As he came toward his fire he saw a duck sitting on the edge of his kettle of boiling water. After the duck flew away Wenibojo' looked into the kettle and found wild rice floating upon the water, but he did not know what it was. He ate his supper from the kettle, and it was the best soup that he had ever tasted. So he followed in the direction which the duck had taken, and came to a lake full of mano'mĭn. He saw all kinds of duck, and geese, and mud hens, and all other water birds eating the grain. After that, when Wenibojo' did not kill a deer, he knew where to find food to eat.

It is a common belief on the Lac Courte Oreille reservation that the Ojibwa Indians first found wild rice on the Red river of the North,

as far west, they say, as the Ojibwa ever dwelt. This was about six generations ago. As Warren said that they estimate a generation at forty years, it would be about 1660. Sixteen hundred and sixty is probably near the time the Ojibwa came into possession of wild rice as a food, for Warren has said that they left La Pointe island in Lake Superior and came south and west onto the mainland between 1612 and 1671. On the Red river of the North the Indians used the grain and found it good. They gathered and sowed some at Snake river, Minnesota. Then they sowed it at Shell lake, and so on to the east in Wisconsin. It was distributed eastward from one Indian to another until today it is found wherever the Ojibwa lives.

Dependence of the Indian on Wild Rice

The food of primitive men varies with the season of the year and the section of the country in which they are. They frequently live upon one staple at a time. In the region of the upper lakes three or four weeks in March, April, or May were given to the making of maple sugar, during which time the people often lived almost exclusively on this food. Indeed, Alexander Henry says of maple sugar making between April 24 and May 12, 1768, "We ate nothing but our sugar during the whole period. Each man consumed a pound a day, desired no other food, and was visibly nourished by it."[1] Soon the early berries were ripe, then green corn (maize) was edible, if the Indian cultivated it, and in September the wild rice came. Both in the spring and autumn wild fowl were countless in the vicinity of rice fields, and furred game and fish were plentiful all the year. The winter was the season for hunting, when stores of pemmican[2] were laid up.

In some sections of the country the rice crop failed partly or wholly at frequent intervals. Information from such sources as Chief Pokagon and government farmers at Indian reservations shows that it so fails once in three or four years.[3] Again, at Grass lake, Lake county, Illinois, where there are 1,000 acres of wild rice, it has not been known to fail in the last sixty years.

These preliminary remarks have been thought necessary in order that the historical sketch and summaries which follow may not overemphasize the value of wild rice in the household economy of the Indians and early whites, for of course other foods must here be largely ignored.

Very positive evidence of the value of wild rice to the Indian comes to us from various Indian agencies. Mr D. P. Bushnell's report for

[1] Henry, Travels and Adventures, p. 218.

[2] Pemmican is lean buffalo meat dried and pounded fine, then mixed with melted fat and packed in buffalo skins. It hardens and will keep for years, but if exposed to moisture it soon becomes musty and unfit for use. One buffalo would make a sack of about 100 pounds. It is a very palatable, nourishing, and healthful food (Harmon).

[3] See page 1099 et seq.

1838 contains the following concerning the Ojibwa of Lake Superior and the Mississippi river:

It is highly desirable that the annuity hereafter to be paid to the Chippewas should be paid between the 1st of June and last of August. [Some of these Indians had to make a total journey of 400 miles to get their annuity.] Their spring hunts are not finished before the former period, and they commence about the 1st of September to gather the wild rice, which is a great article of food with the interior Indians. As soon as they have finished gathering the rice, the fall hunt commences. If called together after the 1st of September, they will generally be more injured than benefited by the sum they receive.[1]

Mr Alfred Brunson, Indian Agent, La Pointe, Wisconsin, wrote Governor Doty, under date of January 6, 1843, as follows: "By the Chippeway treaty of 1837 these Indians are to receive $35,000 annually for twenty years, and by the treaty of 1842 they are to receive an additional annuity of $31,700 for twenty-five years, or a total annuity of $66,700." "The annual products of these lands [between the Mississippi river and Lake Superior] are worth much more to the Indians than they are to receive . . . . The annual value of the furs are estimated at $25,000. There are about 1,000 families," who make $30,000 worth of sugar. "The same number of families average 25 bushels of rice at $1, [which] is $25,000." Canoe material he figures at $10,000, and game and fish at $100,000, or a total natural production of $190,000.[2] Subtracting the value of the canoe material and furs, we find that the value of the wild rice was about one-sixth of that of the total remaining (edible) production.

The following protest, signed by "Martin, head chief of the Ottawa," representing Ottawa Lake, Chippewa River, and Lac Chetac bands, accompanied Brunson's letter (the conditions of the treaty of 1842 were not understood by the chiefs when they signed it): "We have no objection to the white man's working the mines & the timber & making farms. But we reserve the birch bark & cedar, for canoes, the Rice & Sugar trees & the privilege of hunting without being disturbed by the whites."[3]

Again, in 1843, Mr Brunson wrote to Governor Doty, under date of January 10: "But what is of more importance to the Indians than anything else, in reference to their payment, *is the time & place of it*" (the italicized words are underscored in the letter). "But selecting this place [La Pointe] to pay the Inds. of the Mississippi, is next to rendering their payment a nullity: because they loose more by it than their payments are worth to them. If taken away from their Rice harvests they loose more than the whole payment amounts to, say about $7 per head. And if taken away from their fall hunts, it amounts to the same thing." "If the payment of all the Chippewas *must* [underscored in letter] be

[1] Indian Affairs Report, 1838, document 20.
[2] Brunson, manuscript letter book, p. 25, in Wisconsin Historical Society's manuscript collection.
[3] Ibid., p. 47.

at the Pointe . . . [they should be] paid not later than the first of July [in which case] they can reach their rice fields in time to harvest."[1]

One of the chief things the Indians desired in being located on reservations was the presence of rice fields, as is seen in the following cases. The first is a "Petition of the head chiefs of the Chippewa tribe of Indians on Lake Superior," February 7, 1849, as follows:

That our people, to-wit, sixteen bands, desire a donation of twenty-four sections of land, covering the graves of our fathers, our sugar orchards, and our rice lakes and rivers, at seven different places now occupied by us as villages, viz: At View Desert, or Old Garden, three sections; at Trout Lake, four sections; at Lake Coteré, four sections; at La Pointe, four sections; at Ontonagon, three sections; at La Ance, three sections; and at Pah-po-goh-mony, three sections. That we desire these lands for the purposes specified.[2]

In 1858 the agent at Fond du Lac (Lake Superior) wrote:

The Indians at this place are disappointed and sore with regard to the boundary lines of their reserve [made according to treaty of September 30, 1854]. They state that the "Rice lakes" [Perch lake and others of its vicinity] which were to be included in their reservation have been entirely overlooked and left out, and they are unwilling to relinquish their claim to them. These lakes lie a few miles south of the present reserve, and abound in fish and wild rice, which constitute the principal subsistence of these Indians, and their attachment to them is very strong. . . . They wished me to say to their Great Father that they are willing to give up a large portion of the land contained in the present reserve if he will attach to the remainder the coveted lakes.[3]

The agent for these Indians reported, November 29, 1860, that the reservation should have included "Perch lake" which was the only section of the country where they could support themselves the year round. There they obtained an abundance of "field-rice and fish," sugar, and game. There also was their chief settlement. After the boundary was made to include this lake, he said:

It was gratifying to us to witness the pleasure with which the Indians received the intelligence that their farms and rice fields had at last been secured to them, and that they might now go on and cultivate their lands and garner their rice without the fear of being molested or driven away by the white man.

In 1863 Hole-in-the-day (Ojibwa chief) spoke for his people at St Paul, June 7, as follows (they had been moved from Wisconsin to Minnesota, and he asked that they might be removed to a new reservation): "Say that strip of land lying on the Wild Rice river between 47° and 48° north latitude, and east of the Red river. There is every advantage of good soil, game, fish, rice, sugar, cranberries, and a healthy climate." He asked for a land that will "combine all the elements of comfort and content to our people; that is, good land, game, fish, rice, sugar. Here we have neither, to any considerable extent.

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[1] Brunson, manuscript letter book, p. 50, in Wisconsin Historical Society's manuscript collection. These last facts Mr Brunson also wrote under date of July 20, 1843, to Robert Stuart, Acting Superintendent Indian Affairs at Detroit; see manuscript letter book, p. 104.

[2] House Misc. Doc. 36, Thirtieth Congress, second session.

[3] Indian Affairs Report, 1858, p 48.

True, we may find a little rice and a few fish, but not sufficient for my people, not enough to save them from starvation."[1]

In 1865 the agent speaks of the impracticability of moving the Mississippi and Mille Lacs bands of Chippewa to the Red lake country. After speaking of the scarcity of good land and sugar trees, he continued: "There is another great item which must not be overlooked; that is, there are no rice fields in that country, . . . or fishing lakes."[2]

A letter from La Pointe agency, Ashland, Wisconsin, September 10, 1891, is as follows:

> In many of the streams and lakes of these reservations wild rice grows luxuriantly. This important cereal is carefully harvested by the Indians, and constitutes an important part of their subsistence stores. It is palatable and nutritious, and by many white people is preferred to the white rice of commerce. The rice fields are the resort of numerous wild fowl, which are captured by the Indians and either consumed at home or sold in the neighboring towns. The revenue thus derived from the rice fields renders them a very important part of the Indian domain.[3]

This recent testimony of the value of wild fowl to the Indian suggests their much greater utility in past years; and such in fact the following citations prove. When it is remembered that wild fowl are to-day relatively scarce, that through the Central States the sight of any considerable number of wild pigeons is rare, even to one skilled in woodcraft, but that our fathers yet living saw them in such flocks that they shut out the light of the sun, a better perspective will be obtained for judging of the number and value of wild fowl when the Indian and his natural foods were undisturbed by the white man. We read of the Indians of White Earth reservation in 1890, that from August to December they hunt duck, which are found in countless numbers around all the wild-rice lakes.[4] Near the middle of the century wild fowl, as geese, duck, teal, etc., were reported in vast quantities, feeding on wild rice along Green bay,[5] Minnesota river,[6] Winnipeg river,[7] and Lake Winnebago[8] and vicinity.

Carver,[9] in 1766, '67, '68, says the "geefe, ducks, and teal . . . . which refort to it [Lake Winnebago, Wisconsin] in great numbers, are remarkably good and extremely fat, and are much better flavored than thofe that are found near the fea, as they acquire their exceffive fatnefs by feeding on the wild rice."

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[1] Indian Affairs Report, 1863, p. 329 et seq.

[2] Ibid., 1865, p. 446.

[3] Indian Affairs Report, 1891, p. 471.

[4] Eleventh Census of the United States: Indians, 1890. See also Grasses and Forage Plants of the Dakotas, by Thos. A. Williams, p. 17.

[5] Biddle, Recollections of Green bay in 1816–17, in Wisconsin Historical Collections, vol. I, p. 63.

[6] Featherstonhaugh, Canoe Voyage, pp. 331, 335, 336.

[7] Henry Youle Hind, Narrative, pp. 115, 116.

[8] Caleb Atwater, Indians of the Northwest, p. 181; see also Life of George Copway, p. 65, for immense flocks of duck feeding on the wild rice each fall in Rice Lake, Ontario, Canada; also Ellis, Recollections, concerning wild fowl in Wisconsin rice fields.

[9] Carver, Travels, pp. 37–38; see also p. 522.

Hennepin,[1] in 1697, speaks of flocks of duck, swan, and teal which devour the rice at Mille Lacs: "Les femmes [Ojibwa Indians] en lient plufieurs tiges [of wild rice] enfemble avec des écorces de bois blanc, pour empecher que la multitude des Canars, des Cignes, & des Sarcelles, qui s'y trouvent ordinairement, ne la mangent toute."

Dablon speaks of clouds of swans, bustards, and ducks which he saw in Green bay in 1670. The Indians caught them in nets, often taking fifty in one night.[2]

It is unnecessary either to emphasize the value of these fowl as food to the Indian or to call attention to the fact that the fowl were plentiful largely because the wild rice offered them such abundant, wholesome food, but the following point might be overlooked. These fowl were really gleaners, and picked up and preserved in most delicious form the grain which otherwise the Indian would have lost entirely. Heavy waterfowl could not do very great damage to the standing plant, and while the grain was standing the Indian must gather his harvest. When the kernels shelled out into the water they were loss to the Indian, but gain to the fowl, which picked them up by diving to the bottom. It is interesting and instructive to note that of the illustrations cited in the chapter on production, all except the last two—from the Chicago Tribune, October 6, 1898, and Bressany—show the Indian as busied in capturing wild fowl while the Indian woman gathers the grain.

Further evidence of the value of wild rice to the Indian, and of his dependence on it, is found in the following negative testimony. In all of these cases the Indian, for one reason or another, is unable to get his accustomed supply. In some sections of the country the rice crop fails partially or wholly as often as once in three or four years,[3] while in other sections it has not been known to fail for long periods of time.[4] The reason for this difference is doubtless found in the nature of the most frequent cause of failure, viz, drowning by high water.[5]

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[1] Hennepin, Nouvelle Découverte, p. 313* (fol. 0*4).

[2] Relations de Jésuites, Dablon, 1670, p. 96.

[3] Chief Simon Pokagon of the Potawatomi, St. Joseph county, Michigan, says "once in four years" (letter, Nov. 16, 1898). N. D. Rodman, Government farmer in charge of Lac Courte Oreille reservation, Wisconsin, says "once in three years" (letter, Nov. 11, 1898). Stephen Gheen, Government farmer, Vermilion Lake (Nett Lake) reservation, Minnesota, says crops fail "wholly about every three years" (letter, November 15, 1898).

[4] Peter Phalon, Government farmer, Fond du Lac reservation, Minnesota, says, "complete failure of crop never occurs. Crop some seasons is so small it would not pay to gather, there being barely enough for seed . . . After such failures it takes two years to grow a full crop . . . Every alternate year a full crop may be expected, provided no floods occur . . . After a heavy crop one year must elapse before the old straw, necessarily remaining in the beds, decays, thus making room for a full new crop" (letter, December 27, 1898). Roger Patterson, Government farmer, Bad River reservation, Wisconsin, says "the crop never totally fails, but small crop occurs about once in three years" (letter, November 23, 1898).

[5] Henry Youle Hind, Narrative, p. 119; Indian Affairs Report, 1867, pp. 341, 342; ibid., 1870, p. 309; ibid., 1871, p. 597 et seq.; ibid., 1880, p. 175; R. J. N. Pither, letter from Rat Portage, Ontario, Canada. Mr Pither was twenty-five years Indian agent, and the same length of time Hudson Bay Company's trader; N. D. Rodman, op. cit.; Stephen Gheen, op. cit.; Peter Phalon, op. cit.; Roger Patterson, op. cit.; McKenney, Tour of the Lakes, p. 337.

Where high water is never or seldom possible, failures must be less frequent. Frosts also destroy the young plant;[1] while, when the grain is ripe, a storm of a few hours will thresh out into the bottom of the lake or river an entire crop;[2] or, if the storm occurs while the stalk is green and tender, it will be bent over into the water, from which it can not rise again.[3]

Sir John Richardson wrote that in 1847 multitudes of caterpillars spread like locusts over the neighborhood of Rainy river. "They destroyed the *Folle avoine* [wild rice] on Rainy lake," though they did not touch wheat.[4] A letter dated "American Fur Company's establishment, Fond du Lac" (Lake Superior), August 8, 1826, speaks of a freshet the previous spring. It "destroyed the wild rice—and this makes our visit with the supplies we have brought with us so opportune . . . We are here at a moment of the utmost need of the poor Indians."[5]

In 1849 the rice crop of the Pillagers (Ojibwa of Leech lake, Minnesota, numbering about 1,050) entirely failed, and on this article they depended mostly for their winter's support. "Hunger and starvation menace them; and in order to procure means of subsistence their hunters this winter will be forced to press westward till they find the buffalo."[6] The Ojibwa of Sandy lake, Minnesota, numbering about 300, lost their rice both in 1849 and in 1850. The majority of them passed their winters in the vicinity of Crow Wing and Fort Gaines, Minnesota, on ceded lands, hunting and begging for a living.[7] The "Sug-wun-dug-ah-win-in-e-wug" (Ojibwa in Minnesota north of Lake Superior) also lost their rice crop in 1850, "and this people anticipate with aching hearts the sufferings and privations of the approaching winter."[8] These Indians also depended much upon rabbit and reindeer for winter consumption.

Mr Hind, in passing down the Rainy lake waterway in 1857, said that the Indians he met lamented the failure of the rice that year, and this failure, together with poor fishing and extraordinary mortality among the rabbits, threatened them with famine during the coming winter.[9] September 30, 1867, the agent of the Ojibwa of the Mississippi (Minnesota), wrote that the rice crop appeared likely to be almost an entire failure. "This is a great calamity to the Indians, as they depend largely upon it for subsistence, and I fear suffering will ensue in consequence."[10] The Ojibwa of Lake Superior (Wisconsin) lost their crop both in 1869 and 1870 and are "compelled to scatter over

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[1] Chief Pokagon, op. cit.

[2] Dr Morse, Report, appendix, p. 52.

[3] Roger Patterson, op. cit.

[4] Henry Youle Hind, Narrative, p. 93. For further causes of failure, see chapter on botany, section "Natural Enemies."

[5] McKenney, Tour of the Lakes, p. 337.

[6] Indian Affairs Report, 1850, p. 57.

[7] Ibid., p. 56.

[8] Ibid., p. 59.

[9] Henry Youle Hind, Narrative, pp. 118, 119.

[10] Indian Affairs Report, 1867, pp. 341, 342.

the country and seek such subsistence as accident may offer them."[1] Of the Bad River Indians (Ojibwa of Wisconsin) in 1880, we read: "The rice crop will be a failure, and the Indians depend upon this for winter use and also for means of obtaining such articles as they need and are not furnished by the Department."[2]

Comment is unnecessary in the face of such testimony. All shows that the failure of the crop was so infrequent that the Ojibwa Indians depended upon wild rice for their winter subsistence, and that its loss could not be made up by any other resource of natural production.

Dependence of the White Man on Wild Rice

Carver wrote, in 1766, in regard to the use of wild rice by the whites:

> In future periods it will be of great fervice to the infant colonies, as it will afford them a prefent fupport, until in the courfe of cultivation other fupplies may be produced.[3]

Again, in 1828, Timothy Flint said:

> It is astonishing, amidst all our eager and multiplied agricultural researches, that so little attention has been bestowed upon this interesting and valuable grain. It has scarcely been known, except by Canadian hunters and savages, that such a grain, the resource of a vast extent of country, existed. It surely ought to be ascertained, if the drowned lands of the Atlantic country, and the immense marshes and stagnant lakes of the south, will grow it. It is a mistake, that it is found only in the northern regions of the valley. It grows in perfection on the lakes about Natchitoches, south of 32°; and might, probably, be cultivated in all climates of the valley. Though a hardy plant, it is subject to some of the accidents, that cause failure of the other grains.[4]

White men have used this grain chiefly in and near the wild-rice district, yet "in some parts of the Bay [Quinto bay, Ontario, Canada] there grew wild rice, which was much prized by the Indians, and which was often used by the settlers . . . . The grain was much smaller than the imported article; not unfrequently, the Indians would collect the grain and sell it to the settlers."[5]

Alexander Henry said that on July 20, 1775, at Lake Sagunac or Saginaga, 60 leagues from Grand Portage, he bought fish and wild rice "which latter they [the Indians] had in great abundance."[6] July 30, he recorded at "Lake des Iles," or Lake of the Woods, that fish appeared to be their summer food. He found there a village of 100 people, by whom 20 bags of wild rice were given him, and he obtained there a total of 100 bags of nearly one bushel each. He says that without a large quantity of rice the voyage beyond the Saskatchewan river could not have been prosecuted to its completion.[7] Again, August 1,

[1] Indian Affairs Report, 1870, p. 309.

[2] Ibid., 1880, p. 175.

[3] Carver, Travels, pp. 522–524.

[4] Flint, Geography and History, vol. 1, p. 85.

[5] Carniff, History of the Settlements of Upper Canada (Ontario), with special reference to the Bay Quinte, Toronto, 1869, pp. 587–588.

[6] Henry, Travels, p. 241.

[7] Ibid., pp. 243, 244.

he purchased wild rice on a sandy island in Lake of the Woods.[1] And August 16, at Lake Winnipegon, or Winipec (Winnipeg) the Indians "made me the usual presents of wild rice and dried meat."[2] All of this rice mentioned by Henry was of the harvest of some preceding year. It is very remarkable that only one month before a new harvest, a village of 100 people could produce a bushel of rice per capita. No better testimony than Henry's could be given for the dependence of traders upon wild rice during those early years.[3]

Early in January, 1778, the provisions at the trading station at Lac la Mort gave out, so John Long, the trader, made a journey of several days to Lake Monontoye (this journey was south toward Lake Nipegon, north of Lake Superior), to try to get some wild rice of Mr Shaw, a fellow trader, as the Indians said it grew in swamps there.[4] From Mr Shaw's station Mr Long returned in due time with "an Indian slay [sleigh] loaded with wild rice and dried meat." On February 23, 1778, "another band [of Indians] came in [to Lac la Mort] consisting of about eighty, men, women and children, who brought dried meats, oats [wild rice], bears' grease, and eight packs of beaver."[5] Again Long said of Weed lake (Lake Schabeechevan):

> On this lake there are about one hundred and fifty good hunters, who make a great many packs of beaver, &c. and this was one inducement for settling here, which was increased by the prospect of a plentiful supply of fish, rice, and cranberries, which are winter comforts of too great consequence to be slighted.[6]

Mr Long wrote that the last of January, 1779, he was again reduced in provisions "to a few fish and some wild rice, or menomon (which are kept in *muccucks* or bark boxes), to support myself and seventeen men; the allowance to each being only a handful of rice and a small fish, about 2 lb. weight, which is boiled together and makes pleasant soup."[7]

Jean Baptiste Perrault's Indian Life in the Northwestern Region of the United States in 1783 (manuscript), as translated by Schoolcraft,[8] says it was the custom for the traders to buy provisions (wild rice and dried meat) of the Indians. But during the winter of 1783 "the greater part of them [Indians around Leech lake, etc.] had gone to pass the winter in the prairies west of the Mississippi [where buffalo were then plentiful] . . . they had no wild rice, the abundant rains having destroyed it." Notwithstanding this failure, early in May, 1784, these same Leech Lake Indians furnished two fawn skins[9]

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[1] Henry, Travels, p. 244.
[2] Ibid., p. 251.
[3] Voyageurs in their journeys subsist on what ever they can find in the country through which they are passing, rarely taking enough to last them through. The great waterway from Lake Superior to the Northwest, by way of Grand Portage, along Lake of the Woods and the Winnipeg system, frequently furnished four different varieties of staple; the first stage furnished maize, the next rice, the third pemmican, the last buffalo meat (Coues, Henry-Thompson Journal, vol. II, p. 539).
[4] Long, Voyages and Travels, p. 58.
[5] Ibid., pp. 75, 85.
[6] Ibid., p. 109.
[7] Ibid., p. 117.
[8] Schoolcraft, Indian Tribes, vol. III, p. 356.
[9] Ibid., vol. III, p. 356. Fawn skins were taken off nearly whole for use as rice sacks; see also the same work, p. 359.

of wild rice, which had been saved from the harvest of some previous year.

Pike, in 1805,[1] describes the Northwest Company's fort at Leech lake as being 60 by 25 feet, one and one-half stories high, with a loft extending over the entire building, and containing, besides bales of goods and peltries, "chests with 500 bushels of wild rice." The same author says of this company's station at Lake de Sable (Sandy lake) in 1806:

> They raise plenty of Irish potatoes, catch pike, suckers, pickerel, and white-fish in abundance. They have also beaver, deer, and moose; but the provision they chiefly depend upon is wild oats, of which they purchase great quantities from the savages, giving at the rate of about one dollar and a half per bushel.[2]

Harmon wrote in 1804:

> This grain is gathered in such quantities, in this region, that, in ordinary seasons, the North West Company[3] purchase, annually, from twelve to fifteen hundred bushels of it, from the Natives; and it constitutes a principal article of food, at the posts in this vicinity.

In 1813 (probably) a party of 70 persons, composed of Hudson Bay Company traders, Indians, and John Tanner, made the trip from Rainy lake to the mouth of the Assineboin river. They had Indians as hunters to accompany them, "and as we had great quantities of wild rice, we were pretty well supplied with food."[4] Colonel Robert Dickson, Indian agent for the British during the war of 1812–15, wrote to John Lawe of Green bay from Lake Winnebago, February 14, 1814: "All I have left at present is 8 handfulls of foll avoin [wild rice]—10 lbs. Flour—2 Shanks Deers legs three frozen Cabbages & a few potatoes."[5]

Still further light is thrown on the use of wild rice by the traders from the three following extracts. Mr Doty wrote to Governor Cass, under date of November, 1820, of the Indian trade on and about Sandy lake, Aitkin county, Minnesota: "A skin is estimated at $2 . . . The articles received from the Indians are sugar, rice, furs. A mocock of sugar, weighing about forty pounds, is received for four skins; a sack of rice, two skins;" etc. "The American South West Fur Company have the chief trade of this country." They sent in packs from Leech lake, Sandy lake, and Fond du Lac in the years 1819 and 1820.[6] The Detroit Gazette, of November 24, 1820, says: "The fish and the wild rice are the chief sustenance of the traders, and without them the trade could scarcely be carried on [in the Leech lake and Sandy lake districts]."

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[1] Coues, Pike, vol. I, p. 282. [2] Pike, Expeditions, p. 60.

[3] In 1792 the Northwest Company operated all over the Ojibwa country in the United States. They had four departments: First, the Fond du Lac; second, the Folle Avoine, including the country drained by the St Croix river; third, the Lac Courte Oreille, including the country drained by the Chippewa river; fourth, the Lac du Flambeau, including the country drained by the Wisconsin river (Warren, History of the Ojibwas, chapter XXXIV).

[4] Tanner, Narrative, p. 219. [5] Wisconsin Historical Collections, vol. XI, p. 292.

[6] Morse, Report, p. 55.

The section of country referred to in the following quotation produced little, if any, maize, and at the time of the statement the bison were driven several days westward, so that about all the consumable provisions which the Indians could supply were wild rice and maple sugar. Robert Stuart, agent of the American Fur Company, wrote to George Boyd, agent for Indian affairs at Michilimackinac, asking permission to convey "only twelve barrels of whiskey" into the country where they wished to extend their trade, "but the difficulties they have at present to contend with in extending their trade in a direction where they come in immediate contact with the Hudson Bay Company along the frontier, from the Grand Portage to the Lake of the Woods, the situation of the country, and the means of conveyance, completely preclude them from sending in provisions for the support of the people who are necessarily employed in transporting their goods, and for the prosecution of the trade. The Hudson Bay Company get most of their provisions from the Indians for liquor; and as long as those people have this in their power, our people must inevitably be starved."[1]

Doty says, quoted by Dr Morse in 1822: "The fish and the wild rice are the chief sustenance of the traders, and without them the trade could scarcely be carried on."[2] Schoolcraft, who gathered his facts during this period, says, in speaking of the wild rice, "Much of it is sold to the traders, to subsist their men, on their visits to the Indians."[3]

Again we hear from Leech lake in 1835 concerning Mr William T. Boutwell, a missionary:

> His remoteness from the white settlements exposes him to many inconveniences, and compels him to depend almost entirely on the fish of the lakes, and the wild rice gathered in the marshes and creeks, for subsistence; and these afford but a precarious supply. As game is every year becoming scarcer, and their rice so frequently fails, the Indians will soon be driven to the alternative of cultivating the land or perishing by famine.[4]

In the year 1852, Mrs Ellet, a traveler, was given by Mrs Ansell Smith, who resided near the Falls of the St Croix river, "a sack made by the Chippewas [Ojibwa] of braided strips of bark, in a shape rudely resembling a papoose, filled with wild rice which is one of the staples of the territory . . . They [the Ojibwa] sell large quantities to the whites, some preferring it to the common rice of the south."[5] It is unnecessary to cite more instances, but wild rice has been used by

[1] Papers of George Boyd, vol. I, manuscript letter 117 (circa 1820), in Wisconsin Historical Society's manuscript collections.

[2] Morse, Report, appendix, p. 31.

There were 17 trading posts about the headwaters of the Mississippi river in 1826. Six were of the Columbia Fur Company, 9 were of the American Fur Company, 1 was at Fort Green, 1 was a post factory near Fort Snelling, on the St Peters (Minnesota) river (from a "Circular [from] Indian agency on St Peters (Upper Mississippi), 2d April, 1826," in Papers of George Boyd, vol. II, manuscript 90).

[3] Schoolcraft, Indian Tribes, vol. III, p. 63.

[4] Indian Bulletin for 1868, number 2, p. 102.

[5] Mrs Ellet, Summer Rambles, pp. 151, 152.

settlers and traders to the present time. If it could be cultivated with any certainty it would long ago have become a staple in America for the white population, as it was a staple for many thousand Indians before them. It will be interesting to notice its present use, for which purpose a few citations are presented.

Wild rice was offered for sale in 1896 in several towns in Wisconsin and Minnesota. Among those in the former state were Rice Lake, Chetek, and Cumberland, in Barron county, Bloomer in Chippewa county, Shell Lake in Washburn county, and Hayward in Sawyer county. In Minnesota it was sold in Bemidji and Park Rapids in Hibbard county, in Tower, St Louis county, in Grand Rapids, Itasca county, and in Minneapolis. Besides in the above markets it is also sold at the various Indian reservations and at towns in their vicinity.[1] Mention is made that it has been shipped quite extensively, during the past few years, from Chetek to Menomonie, Chippewa Falls, and other places, and Mr C. W. Moore retailed in Chetek, in 1894, about 1,500 pounds. His letter[2] also states that "all old residents of Barron and Dunn counties are very fond of it." Mr Charles C. Oppel,[3] of C. H. Oppel & Sons, wholesalers and retailers in Duluth and Tower, Minnesota, wrote from Tower: "Most of the cruisers, explorers, and homesteaders take it [wild rice] out into the woods with them. They claim that it is better than tame rice, because it don't take so long to prepare it. We also ship considerable; fact is, we handle from 1 to 2 tons a season." Mr J. A. Gilfillan[4] wrote from White Earth, Minnesota: "Among whites in Minnesota it is used only by missionaries and their families, old Indian traders, and very old settlers, and by a few merchants along the line of the St Paul Railroad." It is used in various lumber camps in the regions where it grows, and is also sold to gun clubs quite extensively; they plant it in small lakes as food for waterfowl. Besides the dealers above mentioned, Currie Brothers, Milwaukee, Wisconsin, advertise it in their Horticultural Guide for 1899. They have sold it in small quantities, one or two hundred pounds a year, for the past ten years.[5] L. L. May & Co., of St Paul, Minnesota, advertise it in Farm and Floral Guide for 1899. This latter firm sells about 3,000 pounds during the season.[6] All of the grain thus sold is gathered by the Indians.

The foregoing facts are sufficient to show that wild rice was a valuable and valued food to the pioneer whites of the northwest. It must be regretted that so nutritious a cereal was a precarious crop and has not, apparently, warranted extensive cultivation.

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[1] I am indebted to Mr Gardner P. Stickney, of Milwaukee, Wisconsin, for the use of manuscript letters concerning most of the facts here presented about the present use of wild rice by the whites.

[2] C. W. Moore, letter, Chetek, Wisconsin, April 29, 1896.

[3] Charles C. Oppel, letter, Tower, Minnesota, May 4, 1896.

[4] J. A. Gilfillan, letter, White Earth, Minnesota, May 4, 1896.

[5] Currie Brothers, letter, Milwaukee, Wisconsin, May 6, 1899.

[6] L. L. May & Co., letter, St. Paul, Minnesota, May 10, 1899.

Indian Population of the Wild-Rice District

It is believed that the section of country in the United States which grew wild rice so abundantly—that is, the northeastern and northern parts of Wisconsin and the part of Minnesota east of the Mississippi river—sustained an Indian population equal to all the other country known as the Northwest territory, viz, all those States lying between the Ohio and Mississippi rivers and Lakes Superior and Huron. This would include southwestern Wisconsin, Illinois, Indiana, Ohio,

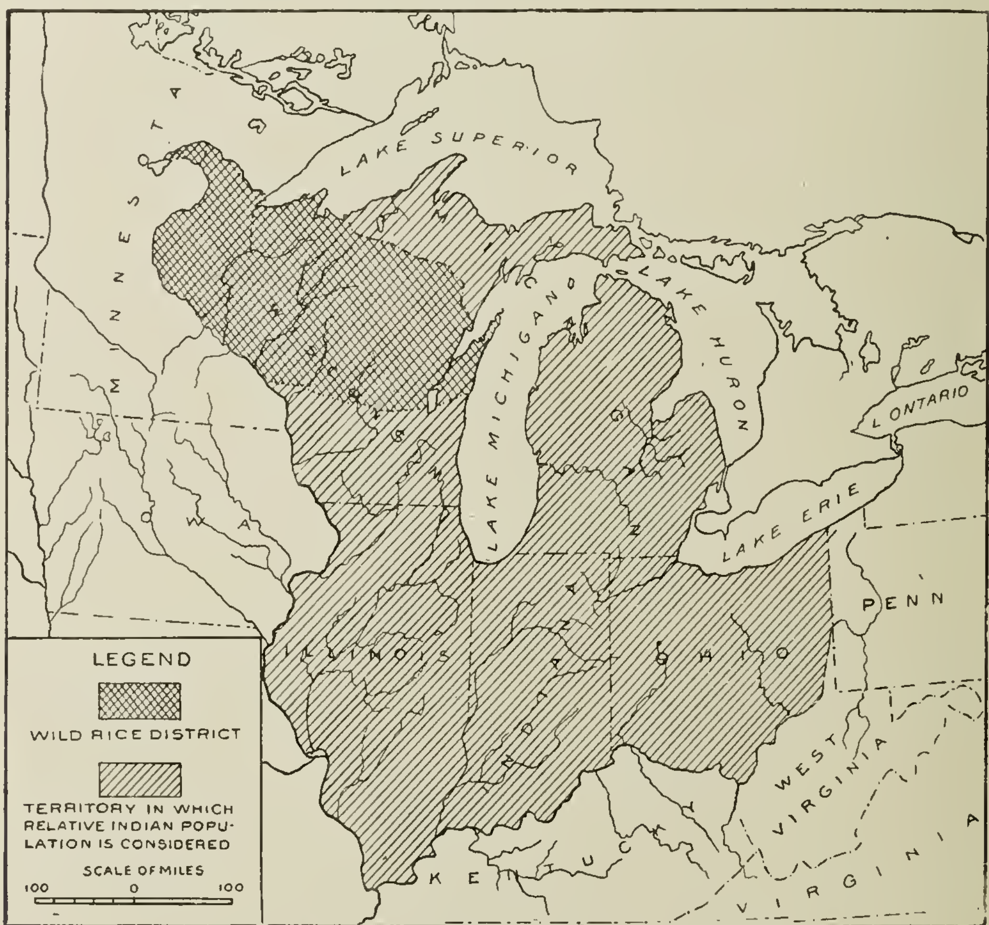

Fig. 48—Map showing areas whose population is compared.

and Michigan (see figure 48). This statement applies to the period when the Indian lived by aboriginal and not by civilized production. Estimates of the Indian population will be presented to substantiate the belief. Roughly speaking, the wild-rice district is about one-fifth of the entire territory considered.

Mr S. S. Hebberd[1] said of this section of the United States:

> In fine, the six States lying east of the Mississippi and north of the Ohio—excluding Northeastern Wisconsin[2]—contained a population in 1670, of less than

[1] Hebberd, History of Wisconsin under the Dominion of France, p. 32 et seq.

[2] There are only five States in the included territory.

twelve hundred warriors [1,200] or eight thousand [8,000] souls . . . Turning now to Northeastern Wisconsin we behold a wonderful contrast. Stretched along both sides of Green Bay and the Fox river as far south as Green Lake county was a territory about one hundred and thirty-five miles long and of an average width of thirty miles, which fairly teemed with human life. In the North, and on the islands and along the eastern shore of Green Bay, were the Pottawattamies, a docile people, with a keen instinct for trade, who were seeking to become the middlemen in the commerce between the French and the tribes farther west; they numbered not less than five hundred warriors [500].[1] Across the bay were the Menominees, settled upon the river of the same name, a brave but peaceful people.

Charlevoix said of the Menomini,[2] "they are very fine men and the best shaped in all Canada." Cadillac is very flattering in his remarks of them.[3] At the mouth of the Fox river was a mixed village gathered from four or five different tribes; a little distance up the river were the Winnebago. Mr Hebberd thinks that the number of the Winnebago, Menomini, and of the mixed village, could not have been less than 600 warriors. On the west side of Fox river were the Sauk, who numbered 400 warriors. A little way up the Wolf river were the Fox Indians, who numbered about 800 warriors, while southwest of these, on Fox river, was the great palisaded town where the Maskotin and Miami dwelt peacefully together. "Farther on, enveloped in the wild rice marshes, were other towns of the Kickapoos and Mascoutins; all of these tribes together could not have numbered less than the Foxes [800 warriors]."[4] "Here then in this narrow strip of territory was a population of thirty-one hundred [3,100] warriors, or at least twenty thousand [20,000] souls, nearly three times the number that roamed in the vast expanse of surrounding solitude."[5]

Nothing is claimed for the absolute value of the figures in the following estimates. Only their relative value is here considered. Inasmuch as the figures in each table are taken from the same investi-

[1] Hebberd based his estimate, in part at least, on the statement that 300 warriors from this tribe came to Allouez at one time at Chequamegon bay (Allouez, Relations des Jésuites, 1667).

Père Gabriel Dreuillettes said that they had 700 warriors, or 3,000 souls; besides, there were with them 100 men of the Tobacco nation (Relations des Jésuites, 1658, p. 21). This statement seems fully to justify Mr Hebberd's estimate.

[2] Charlevoix, Journal, vol. III, letter XX, pp. 291, 292.

[3] "Les Malhominy ou Folles Avoines sont ainsi appelez à cause de la rivière où leur village est situé, qui produit une quantité prodigieuse de folle avoine, qu'ils recueillent et ramassent comme nous faisons nos bleds . . . Cette nourriture est saine . . . Ils ne sont pas si bazanez que les autres, et s'ils ne se graissoient pas, ils surpasseroient les Francois en blancheur. Les femmes sont aussi assez jolies et plus humaines que celles de leurs voisins" (Margry, Decouvertes, vol. V, p. 121).

[4] Perrot, Memoire sur les Moeurs . . . des Sauvages, p. 127, gives the population of the principal town of the Maskotin and Miami as 4,000 souls; and Allouez, Relations des Jesuites, 1670, gives it as 800 warriors. See also map of the year 1670–71, in Relations des Jésuites, for distribution of Indian tribes in the Green bay district.

[5] From facts already given, Mr Hebberd seems justified in his estimate of the Indian population in the wild-rice district of eastern Wisconsin about the year 1670. At any rate, the thesis of this paragraph, which Mr Hebberd's facts are here given to substantiate, can hardly be doubted thus far. The population of the wild-rice district of the sources of the Wisconsin, Chippewa, and St Croix rivers, of the eastern branches of the Mississippi river, and the southern and western feeders of Lake Superior is not numbered in his estimate. At a very low figure it had 8,000 souls.

For the disposition of these various tribes see Map of New France (parts of the United States and Canada) 1616–1791, to illustrate The Jesuit Relations and Allied Documents, with volume I of Thwaites' edition of Jesuit Relations.

gator, such a comparison is certainly legitimate. The estimates were not made for any such purpose as that for which they are here used, and there was nothing to bias the mind of the investigator in favor of one part of the territory against another. Where the estimates are large, they are so throughout, and vice versa. Thus their relative value is unimpaired.

Table E—*Bouquet's estimate of Indian population in 1764*[1]

A—INDIANS IN THE WILD-RICE DISTRICT

	Warriors	Total population
Près de la Baie des Puants:		
Puans	700	3,500
Folle-Avoine	350	1,750
[Unknown.] Au Sud de la Baie des Puants:		
Mechecouquis	250	1,250
Sakis	400	2,000
Mascoutens	500	2,500
Ouifconfins fur une rivière de ce nom qui tombe dans le Miffiffipi du coté de l'Est	550	2,750
Près des Lacs Supérieur & Michigan:		
Chipwas ... 5,000		
Ottawas ... 900		
[These Ottawa and, judging by other estimates, one-fifth of the "Chipwas" [Ojibwa] belong in Michigan; so there are left in the rice districts]	4,000	20,000
Vers les fources du Miffifipi:		
Sioux des Prairie ... 2,500		
Sioux des bois ... 1,800		
[50 per cent of these were probably in the rice district]	2,150	10,750
Grand total		44,500

[1] Bouquet, Relation Historique, p. 144, et seq. Bouquet estimated the warriors as one-fifth of the total population. The column "Total population" is calculated in accordance with this estimate.

B—INDIANS IN THE REMAINING TERRITORY

Powtewatamis, près de St Jofeph & du Detroit	350	1,750
Chipwas (see estimate for these Indians in rice district)	1,000	5,000
Ottawas (see estimate for these Indians in rice district)	900	4,500
Miamis, fur la Rivière de ce nom, qui entre dans la Lac Erie	350	1,750
Delewares (les Loups) fur l'Ohio	600	3,000
Sur l'Ouabache:		
Kickapoux	300	1,500
Ouachtenons [Wea]	400	2,000
Panquichas [Piankishaw]	250	1,250
Les Shawanefes, fur la Scioto	500	2,500
Kaskafquias, ou Ilinois en général, fur la Rivière des Ilinois	600	3,000
Pianria [Peoria]	800	4,000
Wiandots, près du Lac Erie	300	1,500
Total		31,750

TABLE F—*Estimate of the Indian population in 1778, at the outbreak of the Revolution, by a trader who had resided many years in the vicinity of Detroit*[1]

A—INDIANS IN THE WILD-RICE DISTRICT

	Warriors	Total population
Chippewees, about lake Huron, the upper parts of lake Michigan, and then northwest to the Mississippi, 5,000 (see estimate of 1764, Table E)	4,000	20,000
Mineamies, northwest of lake Michigan	2,000	10,000
Soos, about headwaters of the Mississippi, etc	500	2,000
Grand total	....	32,000

B—INDIANS IN THE REMAINING TERRITORY

	Warriors	Total population
Wiondots, in neighborhood of Detroit and Sandusky	180	900
Potowatomies, in neighborhood of St Josephs river, etc	450	2,250
Miamies, in neighborhood of Miami river	300	1,500
Shawanese, on the Wabash and other branches of the Ohio	300	1,500
Delawares and Munsees, between Pittsburgh and Sandusky, on the Muskingum	600	3,000
Chippewees (see estimate of these Indians in the rice district)	1,000	5,000
Grand total	....	14,150

[1] Schoolcraft, Indian Tribes, vol. III. pp. 560, 561, from manuscripts of James Monroe. This estimate leaves several important tribes out of each district. Only the column headed "Warriors" is given by Schoolcraft. The total population is figured at Bouquet's estimate.

TABLE G—*Lieutenant Z. M. Pike's estimate of Indian population in the wild-rice district in 1806*[1]

	Warriors	Probable total population
1. Chipeways of Sandy lake	45	345
2. Chipeways of Leech lake	150	1,120
3. Chipeways of Red lake	150	1,020
4. Chipeways of St. Croix and Chipeway rivers	104	689
5. Chipeways of other bands generally	1,600	8,000
6. Winnebagoes	450	1,950
7. Menomenes	300	1,350
8. Sues, Minowa Kantong band (which, Pike says (Coues, Pike, I, p. 344), used wild rice very extensively)	305	2,105
9. Sauks	700	2,850
10. Foxes	400	1,750
Grand total	....	[2]21,179

[1] Pike, Account of Expeditions. . . . Table F, to face p. 66, appendix, part 1. Both columns of figures are given by Pike.

[2] Dr Morse called attention to the following fact in his report to the Secretary of War in 1822, Appendix, p. 375: The proportion of warriors to the whole number of Indians in a tribe varies, or did vary at the time of their support by Indian natural productions. He found that where fish constituted a large part of the subsistence the proportion of men was less. This is but to say that in the presence of fish or nourishing subsistence the population increases more rapidly. Among tribes thus favorably situated women and children will be more numerous—a fact to which early chroniclers gave testimony in the wild-rice district of Wisconsin (women as well as children are relatively more numerous among well-nourished primitive peoples, for it was the female child which was oftenest sacrificed by infanticide in such districts as for the time had a scarcity of subsistence). Morse's figures, which follow, explain themselves:

TABLE II—*Ratio of warriors to whole tribe, influenced by quality of sustenance.*

	Warriors	Whole number	Ratio.
Indians south of Red river	13,229	46,370	1 warrior to 3½ whole population
Winnebagoes	900	5,800	1 warrior to 6½ whole population
Menominies	600	3,900	Do.
Indians in Ohio	753	2,257	1 warrior to 3 whole population
Indians in Missouri	7,560	30,000	1 warrior to 4 whole population
Indians west of Rocky mountains, Columbia river region (ate much fish).			1 warrior to 6 whole population

TABLE I—*Estimate of the Indian population in 1822*[1]

A—INDIANS IN THE WILD-RICE DISTRICT

Chippewas, along south shore of Lake Superior to Mississippi river, 19 settlements (Colonel Dickson, long a resident among them, estimates their number at 10,000)	8,335
Chippewas and Ottawas, south side of Lake Superior, west side of Green bay, down toward Chicago	1,600
Menominees, Menominee and Fox rivers, Green bay, and Lake Winnebago	3,900
Winnebagoes, Lake Winnebago, etc., to Mississippi river	5,800
Sioux of the Mississippi and St Peters rivers, Leaf tribe, on Mississippi, above Prairie du Chien, 600 population	300
Red Wing's band, on Lake Pepin, 100 population	50
Great Village of the Yonktons, both sides of Mississippi, above St Anthonys falls, 1,000 population	500
Total	20,485

B—INDIANS IN THE REMAINING TERRITORY

Pottawattamie (Michigan), Huron river	166
Wyandots (Michigan), Huron river	37
Ottawas (Michigan), shore of Lake Michigan and rivers	2,873
Chippewas (Michigan), Saganau river and vicinity	5,669
Delewares, Munsees, Moheakunnunks, and Nanticokes (Indiana and Illinois) (they were numbered in 1816, but in 1822 were scattered)	1,700
Pottawattamies (Indiana and Illinois), southern end of Lake Michigan	3,400
Chippewas (Indiana and Illinois), with the above Pottawattamies	500
Menominees (Indiana and Illinois), on Illinois river	270
Peorias, Kaskaskias, and Cahokias	36
Kickapoos, central Illinois	400
Kickapoos, Illinois, under treaty to move	1,800
Miamies, Weas, and Eel river Indians, central Indiana	1,400
Sauks, both sides of Mississippi river, between the Illinois and Wisconsin rivers, 4,500	2,250
Foxes, with the above Sauks, 2,000	1,000
Ioways (living with the last two, mostly west of Mississippi), 1,000	250

[1] Dr Morse's report to Secretary of War, 1822, table 1.

B—INDIANS IN THE REMAINING TERRITORY—continued

Wyandots, Ohio	542
Shawnees, Ohio	800
Senecas, Ohio	551
Delewares, Ohio	80
Mohawks, Ohio	57
Ottawas, Ohio	377
Total	24,158

In the above table (I) it will be noticed that of those Indians located on the Mississippi river only one-half of each tribe is put in the list; thus it is granted that half of them may be on the west side of the stream, and so out of the district now considered; while of the Sioux (Dakota) the following bands are located in the rice fields of the St. Peters (Minnesota) river, though they are west of the Mississippi, and did the district considered include the western as well as eastern head-waters of this river, they would be included in the table:

Little Raven's band, 15 miles below St Peters river	500
Pineshow's band, 15 miles up St Peters river	150
Band of the Six, 30 miles up St Peters river	300
Others, at Little Rapids and St Peters	250
Total	1,200

It will also be noticed that no foreign Indians are located in the wild-rice district as yet,[1] while in the other territory a total of at least 1,988 Indians have been received from the East. They include the Munsee, Shawnee, Seneca, Delawares, and Mohawk. Also the Potawatomi, Ojibwa (Chippewa), and Menomini Indians to the number of 4,170 have passed south from the wild-rice district into the other territory. Most, if not all, of the above movements are due to the influence of white men. Yet, notwithstanding this fact, the wild-rice district continued to sustain a much larger population per square mile than the other territory under consideration.[2] Besides the Indians in the wild-rice district, there were for many years hundreds, perhaps thousands, of white men engaged in various ways in the fur trade, who subsisted largely on Indian natural production.

What, then, was the cause of this relatively very dense population?

Mr Hebberd[3] says that the strip of territory above described, along Green bay and Fox river, was "like an oasis in a desert . . . The land was exceptionally rich in all essentials of barbaric plenty."

[1] The Oneida and Stockbridge Indians came from New York to the wild-rice district near Green bay in 1821. Morse's report was printed in 1822, while some of his facts were collected as early as 1820.

[2] Schoolcraft, Indian Tribes, vol. III, p. 584, published in 1853, gives estimates which show the rice district had over 22,000 Indian population, while the remaining territory had less than 21,000. In 1829 (House Ex. Doc. 117, Twentieth Cong., second sess.) the population of the wild-rice district was estimated at 45,500, and of the remaining territory at 21,167.

[3] Hebberd, op. cit., pp. 35, 36.

Charlevoix[1] declared it was the "most charming country in all the world." "The lakes and rivers were full of fish and the forests of game; fuel was plenty; the soil was easy to till and yielded richly. But the crowning attraction, doubtless, was the wild rice marshes, offering an abundant harvest without any labor save that of gathering it in the autumn. There indeed, was the Indian Utopia." Dablon called it "a terrestrial Paradise, but the way to it is as difficult as the way to heaven." It was guarded on the east and north by the Great Lakes, on the west by the immense marshes of the Mississippi system. It was guarded internally by the many prosperous, powerful, contented Indian residents, and externally by the Iroquois on the east and the Dakota on the west, both of whom, because of their fierce and deadly enmity, the Ojibwa called "Adders."

These Indians in the wild-rice district exhibited some social aspects which were quite unique. First, the Winnebago, of Siouan stock, had injected themselves among the Algonquian Indians, and, occupying a strip of land from the Mississippi due east to the foot of Green bay, they lived at peace with the Menomini, Kickapoo, Maskotin, Miami, Potawatomi, and other Indians of the Algonquian stock. Among the rice fields were villages in which even four different tribes dwelt in barbaric harmony. Early chroniclers frequently spoke of the superior physical manhood of the Indians in this district, as well as of their peaceful dispositions. On the one hand, these facts were probably due to the superior quality of their subsistence, as wild rice and fish, and on the other, to the abundance of such subsistence, and to the accompanying fact that many could dwell near together; and also to the fact that they must be more sedentary than the plains Indians, in order to reap their annual crop. The river influence in general would also tend toward peaceful life. Rivers and lakes with their innumerable waterways (such as the wild-rice district exhibits probably more completely than any other section of equal size in America) furnished quick, permanent, and easy means of travel and transportation. Thus, even in canoeing, they would learn the value of mutual help. Canoes were less easily carried long distances by land than were the effects of the plains Indians. Constant connection with wild-rice and maple-sugar areas would lead to villages within easy access. At such village sites loyalty to kinship in the tribe was planted, and out of it grew patriotism for country, as was noticeable when the Indians demanded lands where were situated their rice fields, their sugar orchards, and the graves of their fathers. Thus were laid two corner stones of civilization, viz, the peaceful massing of various tribes, and love for a common country. Here, however, the foundation ceased. Wild rice, which had led their advance thus far, held them back from further progress, unless, indeed, they left it behind them, for

[1] Charlevoix, letter 20.

with them it was incapable of extensive cultivation. Its supply was precarious, and there was no way of making it certain. One year the gathering of 3 or 4 per cent of the crop gave food for a winter's consumption, another year its failure, which might occur for any one of many reasons, threatened the people with starvation. In civilization one class of people at least must have comparative leisure in which to develop short-cut methods of doing old things, of acquiring the traditions of the race, and of mastering new thoughts and methods. Such leisure is impossible with a precarious food supply. But, in spite of these facts, for barbaric people during the period of barbarism, the most princely vegetal gift which North America gave her people without toil was wild rice. They could almost defy nature's law that he who will not work shall not eat.

The facts presented in this section prove that the wild-rice district gave natural support to a larger number of Indians (besides many hundred whites) than did the adjoining territory of nearly five times its area. The facts further prove that wild rice was a chief means which made possible this greater population.

The causes which led to the use of wild rice for food are lost to history. Even tradition, with her many volumes written so full of interesting and valuable facts, gives no information on the subject, except that man's hunger caused him to eat the grain. The best evidence now known is that of the Relations des Jésuites. It has been noticed that Ojibwa Indians and early settlers used wild rice in Canada on Quinto bay and the north shore of Lake Ontario, on the north and west shores of Lake Erie, on the east shore of Lake Huron, and on Georgian bay, as well as on Rice and adjacent lakes in the included point of Canadian territory, now Ontario. The Jesuit fathers lived in Indian wigwams, subsisted on Indian foods, were interested and keen observers and intelligent chroniclers of the entire life of the Indian. Religious, social, and economic life received their careful attention. Yet not one word appears to have been written, either by them or contemporaneous chroniclers, about the use of wild rice in this district.[1] Its first mention is that of 1634 in connection with the Menomini Indians, who even then were called "wild-rice men" by their Algonquian kinsmen. It therefore seems probable that in the Ontario district described above the Indians did not use wild rice until scarcity of game, caused by the fur trade with the whites, drove them to it. The Menomini Indians, however, did depend upon it extensively before such scarcity. What influence the scarcity of game had upon the use of wild rice by the other Indians in the wild-rice district it is impossible to say. However, the Winnebago and several thousand Dakota

[1] Miss Emma Helen Blair, assistant editor of the Thwaites' edition of The Jesuit Relations and Allied Documents (Cleveland, 1896 +, 73 volumes), is the authority for the above statement, made before the volumes were accessible.

Indians of the Siouan stock, and the Miami, Potawatomi, Sauk, Fox, Maskotin, and Kickapoo Indians of the Algonquian stock used rice to a certain extent while still surrounded by small game and even by buffalo. The powerful and numerous Ojibwa Indians came into possession of wild rice during the first period of the fur trade; consequently theirs also was not a choice between starvation or the use of rice. This fact is attested by the Annual Report of the Commissioner of Indian Affairs for 1864, in which year $40,000 worth of furs were gathered. But inasmuch as the rice fields where rice is harvested are annually failing, but where it is not harvested rice still grows luxuriantly, it is probable that in most of the wild-rice district the grain has been gathered only a few hundred years, say from three to five, in such quantities as are shown by the tables on page 1075 and following.[1]

[1] The following is from White Earth agency, Minnesota, in 1894: "A good many on the different reservations have, in their proper seasons, gathered wild rice, blueberries, cranberries, and snakeroot, and made considerable quantities of maple sugar; but these are now mere incidents to their support. The lakes in which the wild rice once grew in such abundant quantities have become almost barren" (House Ex. Doc., 3d sess., 53d Cong., 1894-95, vol. xv, p. 150).

Chapter VII

INFLUENCE OF WILD RICE ON GEOGRAPHIC NOMENCLATURE[1]

Introduction

One of the simplest and most natural reasons for calling a particular locality by a definite name is that that locality is characterized by some one product. This is the way that a great deal of America was named by her primitive people. There is "Trout lake," "Elm lake," "Sugar Camp lake," "Rat lake," "Beaver lake," "Rice lake," "Wolf river," "Big Rice river," "Little Rice river," etc. Such names become fixed by continuous use, and often persist long after the object for which they were given has perished.

The purpose of this chapter is to throw further light upon the extensive habitat of wild rice, and the importance of the grain to the Indian. It is desirable to call attention to the fact that some of the places which now bear the name of "Rice" were not so named by the Indian. It will be noticed that the Siouan name for wild rice is found only west of the Mississippi river, except as it is applied to a few small streams immediately tributary to this river from the east, while the Algonquian names dominate the territory east of the river. The explanation of this is the fact that the Dakota Indians were nearly all driven from the territory east of the river before the white man learned their local geographic names. After that time the Indian languages throughout the wild-rice district east of the Mississippi river were Algonquian, with the single exception of that of the Winnebago, who speak the Siouan language.

The dominance of the French in this district during the period of the fur trade explains the prevalence of French geographic names. The making of English names is going on to-day as in the past. Names referring to wild rice are given because of the prevalence of the grain, or are a translation of an Indian or French term.

[1] This chapter can be, at best, only a catalogue, and not even an alphabetic one. For purposes of historic and scientific study, if for no other, Indian geographic names ought to be maintained. If the translation of the Indian name is ugly, or not euphonious, the original is often very musical in sound. No one would think of exchanging the Anglicized "Chicago" for its Indian equivalent "Place of the skunk." Certainly no argument need be made for the beauty of the Anglicized Indian names Illinois, Michigan, Wisconsin, and Mississippi. There is generally better reason for maintaining Indian geographic names than there is for replacing them by some fortuitous name. Yet unscientific and senseless as are some names, one acknowledges amusement when he learns that a map is made designating a lake "Uncle —— Lake," in honor of an old gentleman who is a frequent visitor or hanger-around in a State land office.

Sections of Country[1]

No other plant which was used for food by the North American Indian during the period of Indian natural production has stamped its name upon so extensive a section of territory as has the wild-rice plant. About the year 1820 Dr Morse found that "the rice country extended north to the Lake of the Woods, thence along the northern borders of the United States to Lake Superior; and south to the Ouisconsin [Wisconsin] and Fox rivers, and from the last river northerly along the west side of Lake Michigan."[2] One reads that in 1860 this territory to the south of Lake Superior was called by the Canadians *le pays de la folle avoine.* The French Canadians often spoke of these southern lands as *les terres folles* or *la folle avoine* as "Je veux hiverner à *la folle avoine.*"[3]

At about the date of Dr Morse's Report Schoolcraft said that the *Folle Avoine country* included Lac du Flambeau, Ottowa lake, Yellow river, "Nama Kowagun" of St. Croix river, and Snake river.[4] He presented at that time a map which has drawn upon it a "Great trail to the *Folle Avoine country,*" leading southwest from near present Houghton, on Lake Superior, Wisconsin, into the above "Folle Avoine country." As early as 1792 the great Northwest Fur Company designated one of its four departments, the country drained by the St Croix river, the *Folle Avoine department.*[5]

Manomah Isle (Chambers island) in Green bay is given on Farmer's Fourth Sheet or Map of Wisconsin, Iowa, etc, John Farmer (Detroit, 1848).

Manomin county was created in Minnesota in 1859 by Mr Fridley. In 1870 it was changed to Fridley township of Anoka county.[6]

The Upper Peninsula of Michigan has a *Menominee county,* the section of country which is separated from Wisconsin by the Menominee river.

There is a *Menominee township* in Waukesha county, Wisconsin, and a *Manomin township* in Anoka county, Minnesota, while Freeborn county, Minnesota, has a *Riceland township.*

Rice county, Minnesota, is so named out of respect for the Honorable H. M. Rice.

Great Rice M[arsh] is located on the south side of St Pierre (Minnesota) river near its junction with the Mississippi river on a map by Carver in 1766 or immediately after.[7] In 1796 this same section of territory was called *Rice Swamp,* and along the north side of the river farther to the west were *Rice Marshes.*[8]

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[1] Names referring to wild rice are in italics. In these names the original form is literally followed.
[2] Morse, Report, appendix, p. 30.
[3] Kohl, Kitchi-Gami, pp. 117, 118.
[4] Schoolcraft, Summary Narrative, appendix, p. 576.
[5] Warren, History of the Ojibways, chapter XXXIV.
[6] Coues, Pike, vol. III, , p. 887, under "Fridley."
[7] Map with Carver's Travels . . . 1766–1768.
[8] Map, London, A. Arrowsmith, January 1, 1796: additions, 1802.

Cities, Stations, etc

Indian villages are very often situated at such places as are best also for the villages of early settlers, as the head of tidal waters and the falls of rivers, where there is a natural stopping place, because there boats must be unloaded and portaged, and there also fish for food are usually plentiful. Besides these reasons, which appeal to both the Indian and the white man, the latter finds there necessary water power. Fertile grassy valleys and elevated table-lands bring to both the Indian and white man valuable advantages for a settlement. The Indian seeks to locate his village in a place of safety near his food supply. The sites of a vast number of our present American cities were previously covered with the village dwellings of the Indian, and a number of these places still bear their earlier Indian names. Many such villages were named from the presence of wild rice.

North Dakota claims a *Wild Rice* station and a *Riceville* station, both in Cass county.

In Michigan, Menominee county has a *Menominee* station and also a *Menominee River* station, while Calhoun county has a *Rice Creek* station and a *Rice Lake* station.

In Ontario, Canada, there is a *Menomonee* station on Parry sound.

Jo Daviess county, Illinois, has a *Menominee* station on Big Menominee creek.

In the preceding chapter it was noticed that the Indians about the St Croix and Chippewa rivers received their name from the abundance of wild rice in their vicinity, and Carver presented a map in 1766–68 which located *Rice Village* of the Ojibwa Indians along the east shore of the St Croix river.

According to a map made at the opening of the nineteenth century[1] there was a *Menomonie's castle* on Fox river, near its mouth, at Green bay, and a *Menomonie town* on the west side of the bay.

Schoolcraft, about the year 1820,[2] mentions two "Indian Spring villages," *Great Rice Place* and *Little Rice Place*, on the Namakgum [Nemacagon] river, a southern tributary of the St Croix. These villages were probably in Washburn county, Wisconsin.

In 1836 a map[3] presents five *Mennomonie villages* on the west shore of Green bay, besides one *Mennomonie village* on Big Mennomonie river [Menominee river], and another *Menonnomonie village* on Fox river, a short way from its mouth, another at the head of Lake Winnebago, and still another farther to the east. Probably one of the above villages is presented in 1837 as *Menominieville* on Fox river.[4]

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[1] Map, A. Arrowsmith, London, 1796; additions, 1802.
[2] Schoolcraft, Thirty Years with the Indian Tribes . . . p. 369.
[3] The Tourist's Pocket Map of Michigan . . . by Mitchell, 1836.
[4] Topographical Map of Wisconsin Territory . . . by Lyttle, 1837.

The following year, 1838, Mitchell gives[1] this last village as *Mennomonieville.*

There are in Wisconsin numerous cities and stations which bear their name because of the presence of wild rice in their vicinity, as follows:

Menomonee, in Menomonee township, Waukesha county.

Menomonee Falls, in Menomonee township, Waukesha county.

Menomonie, in Dunn county.

Menomonie Junction, in Dunn county, although this may be the *Menomoniede*, in Dunn county, as given on a map in 1896.[2]

North Menomonie, in Dunn county.

Rice Lake, on Rice lake, in Stanford township, Barron county.

South Rice Lake, on Rice lake, in Stanford township, Barron county.

Rice Lake, in Langlade county.

Riceville, in Washington county.

Nenamonee, on Red Cedar river in Dunn county.[3]

Minnesota also has a small number of rice cities, stations, etc, as follows:

Manomin, in Manomin township, Anoka county (Illustrated Historical Atlas of the State of Minnesota, 1874, Chicago).

Rice Lake, in Dodge county near Rice lake in Clearmont township, Steele county (ibid.).

Rice, in Zumbrota township, Goodhue county (Goodhue County Plat Book, 1894).

Riceford, on Riceford creek, in Spring Grove township, Houston county (Houston County Plat Book, 1878).

Manotnin, at the mouth of Rice river in Ramsey county (Blanchard's Map of the North Western States, Chicago, 1866).

Rice T[*own*], at Sandy lake, probably in present Aitkin county (Map of the United States, etc., John Melish. 1816).

Manannah, on Crow river, in Meeker county (Sectional Map of the Surveyed Portion of Minnesota and the North Western Part of Wisconsin, 1860).

Rice City, south of the preceding in Meeker county (ibid).

Rivers, Creeks, Lakes, and Ponds

Rivers, creeks, lakes, and ponds in the territory under consideration which bear the name Rice, or some of its various synonyms, present unmistakable evidence that at some time such waters grew wild rice (it is, of course, recognized that such a name could have been given in honor of some person, but an effort has been made to exclude all such from the list). The names which follow, therefore, tell their own tale:

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[1] Map of the Settled Part of Wisconsin, Iowa, etc.

[2] The Railroad Map of Wisconsin . . . by D. J. McKenzie, Railroad Commissioner (1896).

[3] Lloyd's New Map of the United States, the Canadas, etc. (1862).

In Ontario, Canada, Trent river, which leads from Rice lake into Quinto bay, is called *Rice R[iver]* in 1817.[1] All other maps examined, both prior to and following the one named, call the stream Trent river.

Menominee river, discharging into Green bay and forming the boundary between the upper peninsula of Michigan and Wisconsin, has had numerous names. Hoffman[2] spells the word *Menomini.* On the same page he also says that the word is from the Indian *Mi'nikä' nisĕ'pe.* Verwyst says that the word is a corruption of *manominig*, or *oumanominig*, meaning "wild-rice people."[3] The following various synonyms have been given to this stream:

Menomonee. Blanchard's Map of the North Western States, Chicago, 1866.

Mun-nom-o-nee. Map of Wiskonsan, Charles Doty and Francis Hudson, 1848.

Munnomonee. Map of Wiskonsin Territory compiled from Public Surveys by Captain Cram. 1839.

Mennomonie. Map of the Settled Part of Wisconsin and Iowa, etc., by Augustus Mitchell, 1838.

Big Mennomonie. The Tourist's Pocket Map of Michigan, by J. H. Young, published by S. Augustus Mitchell, Philadelphia, 1836. *Little Mennomonie* river is shown a short distance up the bay; it is probably the present Fort river.

Menomine. Dr Morse's Report, appendix, p. 47.

Monomonie. Map of the United States, by Abraham Bradley, jr., 1804.

Honomonies. Map, States of America, by J. Russell, 1799.

R. des Oumalouminec ou de la folle auvine. Map with Relations des Jésuites, 1670–71.

R. des Oumalouminecs. Map, Canada, Louisiane et Terres Angloises, 1755, Le S[r] D'Anville.

Malomine. A Map of the British Plantations on the Continent of North America, by Henry Overton [circa 1750].

Outmalouminec R. Map, North America, D'Anville, 1752, patronage of Louis, Duke of Orleans.

R. des Oumaloumine ou de la Folle Farine. Map, Le Canada, ou Nouvelle-France, Paris, 1718.

R. des Oumalouminec. Map, Amerique Septentrionale, D'Anville [1746].

The present Red Cedar river, discharging into the Chippeway river, and also the Chippeway river, which in turn empties into the Mississippi at the southern end of Lake Pepin, have at various times borne names synonymous with wild rice. About the year 1850 Warren

[1] Map, "United States of America. No. 55" [1817].

[2] Hoffman, The Menomini Indians, p. 39.

[3] Verwyst, Geographical Names in Wisconsin, Minnesota, and Michigan having a Chippewa Origin, in Wisconsin Historical Collections, vol. XII, p. 393.

called the Red Cedar the *Me-nom-in-ee*,[1] and at about the same time Schoolcraft named that part of Red Cedar river above Rice lake, in Barron county, the *Folle Avoine*.[2] In 1831 it seems that the entire stream was called *Folle Avoine*. In 1848 the river is given as *Menomonie*, and flows through *Manominikan Lake*.[3] This is undoubtedly the *Rice lake* in Barron county, Wisconsin. About 1850 Warren speaks of *Prairie Rice Lake*, or *Mush-ko-da-mun-o-min-e-kin*, or *Lac la Folle* [Prairie lake] as connected with Pellican lake, which discharges into the Red Cedar river.[4] This Prairie lake receives the waters of *Rice Creek*.[5]

In the year 1836 *Pellican Rice Lake* was given on Red Cedar river.[6] This last is probably Lake Chetak, in Barron county.

In 1795 "Chippeway" river is given on a map.[7] Previous to that time it had very generally been called *Malaminican*, as in 1755, 1750, and 1746.[8]

The *Menomonee* river, discharging into Lake Michigan at Milwaukee, Wisconsin, was the *Munomonee* river on a map in 1844.[9] It was *Menominie* river on a map five years previous,[10] and *Mennomonee* on Mitchell's map of 1838;[11] while in 1835 it was given as the *Menominee*.[12]

The river has a tributary which is now called *Menomonee creek*, which, for most of its course, flows in Ozaukee county.

The Fox river in Wisconsin, which discharges into the southern end of Green bay, had a *Lac des Folles Avoines*, according to a French map of 1688.[13] It is the only lake then represented along the course of the Fox river. Another very old French map[14] has three lakes called *Lac des Folles Avoines* on the present Fox river. An expansion of the Fox river 1 mile wide, near its discharge into Lake Winnebago, was called *Lake Menominey* in 1835.[15] The author probably referred to an arm of the present Big Buttes Des Morts lake. This arm in 1836 was called *Monomonie Lake*.[16] The same year it was also referred to as

[1] Warren, History of the Ojibways, p. 309.

[2] Schoolcraft, Summary Narrative, appendix, p. 543.

[3] Farmer's 4-sheet, or Map of Wisconsin, etc., by John Farmer (Detroit, 1848).

[4] Warren, op. cit., p. 308.

[5] Map, The Lake Region of Northern Wisconsin and Michigan, by Ring, Fowle & Co. (Milwaukee, 1893).

[6] Schoolcraft, Thirty Years.

[7] A Map of the Western Part of the Territories belonging to the United States [1795].

[8] A Map of the British and French Dominions in North America, by John Mitchell, 1755; A Map of the British Plantations, by Henry Overton, 1750; Amerique Septentrional, by D'Anville [1746].

[9] Map of Wiskonsan, by Charles Doty and Francis Hudson, 1844.

[10] Map of Wiskonsin Territory, by T. J. Cram, 1839.

[11] Map by Mitchell, 1838.

[12] A Map of a Portion of the Indian Country lying East and West of Mississippi, for the Topographical Bureau, 1835.

[13] Copy by I. A. Lapham from a map in the Chicago Historical Collection, destroyed by fire in 1871, entitled "Une partie de la Carte oe L'Amerique Septentrionale en L'Annee 1688, par J. Baptiste Louis Franquentin HYD DU ROY, a Quebec en Canada."

[14] See map in Winsor, Mississippi Basin, p. 23, reproduced by Marcel from a map in the Marine at Paris.

[15] Featherstonhaugh, A Canoe Voyage, vol. I, p. 174.

[16] Map of the Territories of Michigan and Ouisconsin, by John Farmer, 1836.

Mennomomi.[1] In 1850 a *Menomin Lake* was shown on Fox river immediately below the present Moundsville, at the upper end of Buffalo lake.[2]

Menominie river, probably the present Wolf river in eastern Wisconsin, was shown on a map in 1836.[3]

The present Little Eau Plaine river, a tributary of the Wolf river between Marathon and Portage counties, Wisconsin, was once known as *Ma-no-min a-kung-a-kauy Se-be* or *Rice Stalks* river.[4] It also flows through a *Rice Lake*.

Between 47° and 48° north latitude a river flows from the east into the Red river of the North which has been noted for more than one hundred years for its production of wild rice. On recent maps it is known as *Wild Rice River*. This river also has a large tributary called *South Branch Wild Rice River*, which in 1836 was said to drain *Lake la Folle Avoine* between Ottertail lake and the sources of the Crowing (Crow Wing) river.[5] In 1885 Bell wrote[6] that at one time the *Wild Rice* river was known as the *Menomone*, and also as the *Pse* river. In the years 1861, 1848, and 1843 the river was called *Manomin* or *Wild Rice River*.[7] On map of 1857 this stream was called *Mamonia River*.[8] In 1836 it was known as *la Folle Avoine*.[9] In 1822 Dr Morse called it *Wild Oats Cr.*,[10] while Beltrami in 1828 wrote it *Wild Oats* river.[11] According to a map of 1816, *Wild Oats Cr*[*eek*] and *Rice Straw Cr*[*eek*] both discharge into Red river of the North from the east, between 47° and 48° north latitude. It is quite probable that these refer to the *Wild Rice River* and *South Branch Wild Rice River*, as these two streams join not far from where their waters enter the Red river of the North. At the beginning of the nineteenth century the stream was called *Rice Straw* river, and immediately north of it is a *Wild Rice* river which flows into Red Lake river, which, in turn, empties into the Red river of the North.[12] This *Wild Rice* river last spoken of is probably the Clear Water river rising in Mitcha or Big Boulder lake on Mitchell's map.

Another historic wild rice producing river flows into the Red river of the North. This second one discharges near Fargo, North Dakota,

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[1] The Tourists Pocket Map of Michigan, Mitchell (Philadelphia, 1836).

[2] Map, The State of Wisconsin, Lapham (Milwaukee, 1850).

[3] Farmer, Map of the Territories of Michigan and Wisconsin, 1836.

[4] Wisconsin Historical Collections, vol. I, p. 120.

[5] Map of the Territory of Wisconsin, by Burr, 1836.

[6] Chas. N. Bell, Historical Names and Places, in Trans., Manitoba Hist. and Sci. Soc., vol. XVII, 1884–85, p. 5 (Winnipeg, 1885).

[7] Map of the United States of North America, supplement to Illustrated London News (June 1, 1861); map, United States of North America, by Sherman & Smith (New York, 1848); map, Hydrographical Basin of the Upper Mississippi River, Nicollet, 1843.

[8] A New and Complete Railroad Map of the United States, Wm. Perris (New York [1857]).

[9] Map of the Territory of Wisconsin, by Burr, 1836.

[10] Map with Morse's Report.

[11] Beltrami, Pilgrimage, vol. II. See map of Mississippi river.

[12] The second section of the map entitled "London, A. Arrowsmith, January 1, 1796. Additions 1802."

and flows from the southwest. Unlike the river just considered, this one bears the Siouan name. In 1861 it is found as *Wild Rice* river.[1] In 1850 it was called *Psau* or *Wild Rice*,[2] while in 1848 and 1843 it was given as *Psihu* or *Wild Rice* river.[3] A map of 1838 gives the stream as *Pse* river.[4]

During the year 1836 two synonyms are found, the word being written both *Pse*[5] and *Ipse*.[6] Beltrami named this stream, as well as the one on the east side of the Red river of the North, the *Wild Oats* river,[7] the one from the west being called *Sau - Watpa*. *Watpa'* is the Dakota word for river.[8] Keating said that in 1823 the traders called both of these tributaries of the Red river of the North *Wild-rice*, or *Folle Avoine*.[9] Tanner calls the one which discharges from the west the "Gaunenoway," and Coues says that "Gaunenoway stands for *Manominee*.[10]

Besides the Red Cedar river, which discharges into the Chippeway and through it into the Mississippi, and both of which have borne names synonymous with wild rice, other waters will be mentioned which feed the upper Mississippi, all of which bear the wild rice cognomen.

In 1892 there was a *Manomin* river flowing into the Mississippi from the east. It drains both *Rice Lake* in Aitkin county, Minnesota, and a *Manomin* lake near at hand, while immediately north of it is another *Rice* lake draining into Sandy lake at Aitkin county.[11] *Wild Oats* river is the name given this stream in 1819.[12] About fifteen years previous Lewis and Clarke called it *Wild Oats R*[*iver*].[13] It enters the Mississippi river from the east between degrees 46 and 47 north latitude. This is probably the *Manomin* river of the map "Hydrographical Basis . . . " made in 1843. Beltrami wrote that he named two lakes, some 5 or 6 miles in circumference, near the source of the Mississippi, *Manomeny-Kany-aguen*, because, as he explained it, they were full of wild rice.[14] *Psin-ta-wak-pa-dan* or *Little Rice River* is now called *Rice Creek*, and empties into the Mississippi from the east a few miles north of Minneapolis.[15] *Pinidiwin* or *Manomin* or

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1 Map of the United States of North America, supplement to Illustrated London News (June 1, 1861).

2 General-Karte Der Vereinigten Staaten von Nord-Amerika, by Albrecht Platt, 1850 (after T. Calvin Smith's New York Karten).

3 United States of America, by Sherman and Smith (New York, 1848); map, Hydrographical Basin of the Upper Mississippi River, after Nicollet (1843).

4 Map of the Settled Part of Wisconsin. Mitchell, 1838.

5 Map of the Territories of Michigan, by Farmer, 1836.

6 Map of the Territory of Wisconsin, by Burr, 1836.

7 Beltrami, op. cit.

8 Ibid., vol. II, 337.

9 Keating, Narrative, vol. II, 37,

10 Coues, New Light, vol. I, note, p. 147.

11 Plat Book of Morrison county (1892).

12 Warden, United States of North America, vol. I, p. 117 (Edinburgh, 1819).

13 Map in Lewis and Clarke, Travels.

14 Beltrami, op. cit., vol. II, p. 408.

15 Gordon, op. cit., p. 58.

Rice Lake discharges its waters into the Mississippi by a short thoroughfare in section 24, township 146 north, range 35 west in Minnesota.[1]

In 1879 Aitkin county, Minnesota, had three *Rice* lakes northeast of Mille Lacs. In one place the northernmost one is called *Manoman*, while again the westernmost one is *Manomin*.[2]

Coues speaks[3] of the Pinnidiwin or Carnag or De Sota river. It is the west branch of the source of the Mississippi, and flows through *Lake La Folle*, *Rice*, or *Manomin*. Rand and McNally now call this waterway *Lake Monomina*. Schoolcraft speaks of the lake as *Lac la Folle*, and *Monomina* from *Monominakauning* (place of wild rice).[4]

The Mississippi also drains *Manomin L*[*ake*] between Wakomite creek and "Cow Horn," north of Itasca lake.[5] There was also a *Rice* river flowing into the Mississippi from the east, a short distance above St. Paul, in 1856.[6] It is called *Rice creek* in 1874, while Coues later calls it *Rice* or *Manomin cr*[*eek*].[7]

Neill mentioned Otonwewakpadan or *Rice creek* in Minnesota as one of the two places where, traditionally, the Dakota first planted maize.[8] The same writer in translating the French author of the Memoir of the Sioux spoke of *Wildrice Lake* 15 leagues below Rivière au Serpent (Snake river), Minnesota. It may be the present *Rice Lake* in northeastern Anoka county. Dr Morse mentions *Pauc-quau-me-no-min-ic-con* or *Rice Lake* as being 20 or 25 miles south of Sandy lake, Aitkin county, Minnesota.[9]

Coues says that a feeder of Sandy lake near Leech lake, Minnesota, which flows in at the southernmost end is called "Sandy, Sandy Lake, or *Rice Lake R*[*iver*]". This river has a branch from *Manomin* or *Rice Lake*, and either the branch or the entire river is the *Menomeny-sibi* or *Wild Oats* river of Beltrami, according to Coues.[10] *Rice Lake* in Little Falls township, Morrison county, Minnesota, is fed by *Rice creek* and discharges into the Mississippi by way of the Platte river.[11]

In the year 1856 a *Rice Lake* was drained by Le Suer [Le Sueur] river into Minnesota river from the south.[12] Seven years prior to this the lake is called *Psah L*[*ake*] and is drained by *Psah R*[*iver*] into Le Sueur river and then into the Minnesota. The same map[13] presents

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[1] Coues, Botanical Gazette, December, 1894, p. 506.
[2] Map, Department of the Interior, General Land Office, state of Minnesota, 1879.
[3] Coues, Pike, vol. I, p. 163, note.
[4] Schoolcraft, Summary Narrative, pp. 248, 249.
[5] Minnesota Historical Collections, vol. VIII, part 2 (1896), p. 236, pl. IV.
[6] Map of southern Minnesota and part of Wisconsin, by Harris, Cowles & Co. (Boston, 1856).
[7] Coues, Pike, note 6, p. 94.
[8] Neill, Indian Trade, in Minnesota Historical Society's Collections, vol. I, p. 32.
[9] Morse, Report, appendix, p. 35.
[10] Coues, Pike, note 49, p. 137.
[11] Morrison County Plat Book, 1892.
[12] Map of southern Minnesota by Harris, Cowles & Co., Boston, 1856.
[13] Map of the Territory of Minnesota, exhibiting route of the expedition to the Red river of the north, 1849, by John Pope.

a *Psah L[ake]* just north of the Minnesota river where *Rice* marshes were located on earlier maps. Coues explains that *Rice River* near Brainer county, Minnesota, is the Nagajika creek of Nicollet.[1] *Big Rice River* and a *Little Rice River*, in Oneida county, Wisconsin, discharge their waters into the Wisconsin river.

Jo Daviess county, Illinois, has a *Big Menominee creek*, which is a tributary of the Mississippi river at "Nine-mile island" or "Number 232," and this creek is also fed by a smaller one called *Little Menominee creek*.

A *Rice* creek discharges into Kalamazoo river at Marshall, Michigan.

It is believed that the following bodies of water, mostly lakes, receive their names from wild rice. Their location is given as accurately as is possible, but no claim is made for the identification and exact location of all the places previously named in this chapter, in consequence of which some of them may be unavoidably repeated in the present list:

Poygan Lake, Winnebago county, Wisconsin, from the Menomini word *powahĕcănnĕ*, or "threshing [wild-rice]."

Rice Lake, Ontario, Canada, between lake Simcoe and Quinto bay.

Rice Lake, Newago county, Michigan, Grant township.

Rice Lake, the head of Shell river, a tributary of the St Croix, is given by Warren, History of the Ojibways, p. 164.

Rice Lake, Forest county, Wisconsin, township 35, range 12, near Crandon.

Rice Lake, Forest county, Wisconsin, township 35, range 11, near Crandon.

Rice Lake, Oneida county, Wisconsin, township 36, range 7 east (Pocketbook Map of Oneida, Vilas, and range 4 of Iron counties, Wisconsin, E. S. Shepard, Rhinelander, Wisconsin, [circa 1898]).

Big Rice Lake, Oneida county, Wisconsin, township 36, range 6 east (ibid.).

Rice Lake, Vilas county, Wisconsin, township 41, range 8 east (ibid.).

Rice Lake, Vilas county, Wisconsin, township 39, range 10 east (ibid.).

Rice Lake, Vilas county, Wisconsin, township 42, range 7 east (ibid.).

Scattering Rice Lake, on line between Forest and Vilas counties. It is drained by the Wisconsin river (ibid.).

Little Rice Lake, Vilas county, Wisconsin, between the triangle of lakes, Boulder lake, Fish Trap lake, and Trout lake. *Rice creek* is connected with Big lake, which lies immediately west of Little Rice lake (Map of the Famous Hunting and Fishing Grounds embraced in the Lake Region of Michigan, Poole Bros., Chicago, 1895).

Rice Lake, Polk county, Wisconsin, Alden township (Polk County Plat Book, 1888).

Rice Lake, Polk county, Wisconsin, Milltown township (ibid.).

Rice Lake, Polk county, Wisconsin, West Sweden township (ibid.).

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[1] Coues, Pike, note 41, p. 131.

Rice Lake, Dane county, Wisconsin, Albion township (Dane County Atlas, 1873).

Rice Lake, Barron county, Wisconsin, Stanford township (Barron County Plat Book).

Opukwa, or *Rice Lakes* (Wis. Hist. Colls., vol. I, p. 75).

Rice Lake, Ottertail county, Minnesota, Rush Lake township (Ottertail County Plat-Book, 1884).

Rice Lake, Ottertail county, Minnesota, Hobart township (ibid.).

Rice Lake, Ottertail county, Minnesota, Friberg township (ibid.).

Rice Lake in the city limits of Minneapolis (An Illustrated Historical Atlas of the State of Minnesota, Chicago, 1874).

Rice Creek, Washington county, Minnesota, Oneka township (ibid.).

Rice Lake, Scott county, Minnesota, Spring Lake township (ibid.).

Rice Lake, Carver county, Minnesota, Chandhassen township (ibid.).

Rice Lake, Carver county, Minnesota, between Waconia and Benton townships (ibid.).

Rice Creek, Blue Earth county, Minnesota, Sterling township, discharges into Maple river (ibid.).

Rice Lake, Blue Earth county, Minnesota, McPherson township (ibid.).

Rice Lake, Le Sueur county, Minnesota, Sharon township (ibid.).

Rice Lake, Rice county, Minnesota, Shieldsville township (ibid.). This lake may be named after the Honorable H. M. Rice, as is the county.

Rice Lake, Steele county, Minnesota, Havana township (ibid.).

Rice Lake, Waseca county, Minnesota, Janesville township (ibid.).

Rice Lake, Waseca county, Minnesota, on the border between Blooming, Grove, and Woodville townships (ibid.).

Rice Lake, Freeborn county, Minnesota, Riceland township (ibid.).

Rice Lake, Faribault county, Minnesota, Dalevan township (ibid.).

Rice Lake, Faribault county, Minnesota, Foster township (ibid.).

Rice Lakes, Stearns county, Minnesota. These are several large lakes in Eden, Lake, and adjoining townships (ibid.).

Rice Lake, Mille Lacs county, Minnesota, Greenbush township (ibid.).

Rice Creek, Anoka county, Minnesota. It flows into the Mississippi river from the east (ibid.).

Rice Lake, Anoka county, Minnesota, between Bethel and Linwood townships (ibid.).

Rice Creek, Kanabec county, Minnesota. It discharges into the Snake river in the southeastern part of the county (ibid.).

Rice Lake, Isanti county, Minnesota, Maple Ridge township, from which flows the *Rice Creek* just cited (ibid.).

Rice Lake. Todd county, Minnesota, Hartford township (ibid.).

Rice Lake, Morrison county, Minnesota (ibid.).

Rice Lake, Wright county, Minnesota, Franklin township (ibid.).

Big Rice Lake, Cass county, Minnesota (ibid.).

Rice Lake, Hennepin county, Minnesota, Eden Prairie township (ibid.).

Wild Rice Lake, St. Louis county, Minnesota, northeast of Duluth (ibid.).

Rice Lake, St. Louis county, Minnesota (ibid.).

Rice L., a pond more than 1 mile long, at the north end of Little Lake Winnibigoshish (Coues, Pike, vol. I, note, p. 325).

Rice Lake, or Lake Ann, an expansion of Brown creek [Minnehaha] (ibid., note 4, p. 90).

Rice L., near Pokegama, Minnesota (ibid., note 54, p. 147).

This chapter presents over one hundred and sixty places which have borne a name synonymous with wild rice. Of these some few are doubtless duplicates, though great care has been exercised to avoid such.[1]

When it is called to mind how the North American Indians and those following them were led to name a certain place by its characteristic product, a better perspective is obtained for viewing the importance of wild rice as a food-supply during the period of aboriginal production.

After a cursory comparative study it is believed that more geographic names have been derived from wild rice in this relatively small section of North America than from any other natural vegetal product throughout the entire continent.

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[1] The material for this chapter has been collected from books, maps, and atlases. It is often impossible to locate the places mentioned in the first class of sources. Old maps are not detailed or authentic enough for strict accuracy. The counties of northern Wisconsin and Minnesota have not been surveyed so that accurate county atlases may be made, while in all of the States which grow wild rice few atlases have been made. Inasmuch as it is the smaller lakes and ponds which bear wild rice most abundantly, there are many bodies of water locally bearing a name for wild rice which the present maps do not show.

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TANNER, Edward. Detroit Gazette, 1819–20.

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[TRAILL, Catherine Parr.] The backwoods of Canada: being letters from the wife of an emigrant officer. London, 1836.

TRAILL, Catherine Parr. Canadian Crusoes. A tale of the Rice lake plains. Edited by Agnes Strickland. 2d ed. London, 1862.

TRELEASE, William. Preliminary list of Wisconsin parasitic fungi.

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UPHAM, Warren. Catalogue of the flora of Minnesota, including its phænogamous and vascular cryptogamous plants, indigenous, naturalized, and adventive. The geological and natural history survey of Minnesota. Minneapolis, 1884.

VERWYST, Chrysostom, *Reverend*. Missionary labors of Fathers Marquette, Menard, and Allouez in the Lake Superior region. Milwaukee, 1886.

———. Historic sites on Chequamegon bay.

In Wis. Hist. Colls., vol. XIII, pp. 426–440. 1895.

———. Geographical names in Wisconsin, Minnesota, and Michigan having a Chippewa origin.

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WARDEN, D. B. Statistical, political, and historical account of the United States of North America; from the period of their first colonization to the present day. Edinburgh, 1819, 3 vols.

WARREN, William W. History of the Ojibways, based upon traditions and oral statements.

In Minnesota Historical Society Colls., vol. V, 1885, pp. 23–394. Also contains History of the Ojibways and their connection with fur traders, based upon official and other records, by Edward D. Neill, pp. 395–510.

WEBBER, Herbert J. (See BESSEY, Chas. E.)

WILLIAMS, Thomas A. Grasses and forage plants of the Dakotas.

In U. S. Dept. of Agric., Div. of Agrostology, Bulletin 6. Washington, 1897.

WILSON, Edward F., *Reverend*. The Ojebwa language: a manual for missionaries and others employed among the Ojebwa Indians. Toronto, 1874.

LIST OF CORRESPONDENTS

ASH, Benjamin C., Lower Brulé, South Dakota, February 24, 1899 (agent of Lower Brulé agency, South Dakota).

BARTON, N. W., Baltimore, Maryland (about December 10, 1898).

BEGG, Magnus, Fort Frances, Ontario, Canada, January 17, 1899 (agent of the Coucheeching agency, Ontario, Canada, about Rainy lake).

BESSEY, Charles E., Lincoln, Nebraska, December 9, 1898.

BEYER, George E., New Orleans, Louisiana, December 19, 1898.

BINGENHEIMER, George H., Fort Yates, North Dakota, November 15, 1898 (agent of Standing Rock Agency, North Dakota).

Bishop, W. H., Newark, Delaware, December 12, 1898.
Blankinship, J. W., Bozeman, Montana, December 12, 1898.
Brannon, Melvin A., Grand Forks, North Dakota, December 10, 1898.
Bray, William L., Austin, Texas, December 13, 1898.
Campbell, John C., Athens, Georgia, April 13, 1899.
Clapp, William R. (Major, U. S. A.), Pine Ridge, South Dakota, November 12, 1898 (agent of Pine Ridge Agency, South Dakota).
Clinton, G. P., Urbana, Illinois, May 3, 1899.
Coues, Elliott (M. D.), Washington, District of Columbia, February 16, 1899.
Crandall, C. S., Fort Collins, Colorado, December 12, 1898.
Currie Brothers, Milwaukee, Wisconsin, May 6, 1899.
Davy, J. Burtt, Berkeley, California, December 6, 1898.
Dodson, W. R., Ann Arbor, Michigan, November 12, 1898.
Evans, A. Grant, Muscogee, Indian Territory, April 25, 1899.
Evans, Alexander W., New Haven, Connecticut, January 3, 1899.
Fernald, M. L., Cambridge, Massachusetts, December 12, 16, 1898.
Garman, H., Lexington, Kentucky, December 17, 1898.
George, D. H., Keshena, Wisconsin, December 8, 1898 (agent of Green Bay agency, Wisconsin).
Getchell, Fred O., Fort Totten, North Dakota, November 10, 1898 (agent of Devils Lake agency, North Dakota).
Gheen, Stephen, Nett Lake, Minnesota, November 15, 1898 (Government farmer, Nett Lake reservation, Minnesota).
Gilfillan, J. A.,[1] White Earth, Minnesota, May 4, 1896.
Goodrich, D. L., Hampton, Virginia, December 10, 1898.
Grant, A. J., Plymouth, New Hampshire, December 22, 1898.
Harding, John W., Greenwood, South Dakota, November 10, 1898 (agent of Yankton agency, South Dakota).
Harvey, F. Z., Orono, Maine, December 9, 1898.
Henderson, L. F., Moscow, Idaho, December 11, 1898.
Hillman, F. H., Reno, Nevada, December 12, 1898.
Hitchcock, A. S., Manhattan, Kansas, April 24, 1899.
Holferty, G. M., Cincinnati, Ohio, April 17, 1899.
Howard, O., Salt Lake City, Utah, December 13, 1898.
Jesup, Henry G., Hanover, New Hampshire, December 13, 1898.
Johnson, Nathan P., Sisseton agency, South Dakota, November 19, 1898 (agent of Sisseton agency, South Dakota).
Jones, L. R., Burlington, Vermont, December 27, 1898.
Jones, Marcus E., Salt Lake City, Utah, December 23, 1898.
Lake, E. R., Corvallis, Oregon, December 30, 1898.
Langlois, A. B., St. Martinsville, Louisiana, November 21, 1898.
McBain, Samuel, Knoxville, Tennessee, December 9, 1898.
McChesney, Charles E., Rosebud, South Dakota, November 12, 1898 (agent of Rosebud agency, South Dakota).
McNeill, Jerome, Fayetteville, Arkansas, December 21, 1898.
Macfarlane, John M., Philadelphia, Pennsylvania, December 12, 1898.
Mackay, A. H., Halifax, Nova Scotia, May 1, 1899.
Macloskie, G., Princeton, New Jersey, December 15, 1898.
Markle, J. A., Birtle, Manitoba, Canada, November 21, 1898 (Indian agent of Western Manitoba, Canada).
Martineau, H., Portage la Prairie, Manitoba, Canada, November 18, 1898 (Indian agent in the Lake Manitoba Indian inspectorate).
Mathews, C. W., Lexington, Kentucky, December 15, 1898.

[1] Kindness of Mr Gardner P. Stickney, Milwaukee, Wisconsin.

Matsumura, J., Tokyo, Japan, December 6, 1898 (professor of botany at the Imperial University).

May, L. L., & Co., St. Paul, Minnesota, May 10, 1899.

Mill, P. H., Auburn, Alabama, May 1, 1899.

Moore, C. W.,[1] Chetek, Wisconsin, April 29, 1896.

Mottier, D. M., Bloomington, Indiana, December 26, 1898.

Motzfeldt, J., Pelican Lake, Wisconsin, December 3, 1898. Mr Motzfeldt has lived about forty years in the above district.

Nelson, Aven, Laramie, Wyoming, December 12, 1898.

Newcombe, F. C., Ann Arbor, Michigan, December 9, 1898.

Oppel, Charles C.,[1] Tower, Minnesota, May 4, 1896.

Paddock, L. A., Grass Lake, Illinois, January 20, 1899. Mr Paddock has lived sixty years on Grass lake, where there are 2,000 acres of *Zizania aquatica*.

Patterson, Roger, Odanah, Wisconsin, November 23, 1898 (Government farmer, Bad River reservation, Wisconsin).

Phalon, Peter, Cloquet, Wisconsin, December 27, 1898 (Government farmer, Fond du Lac reservation, Wisconsin).

Pither, Robert J. N., Rat Portage, Ontario, Canada, December 5, 1898. Mr Pither was in the Hudson Bay Company twenty-five years and Indian agent in the Coucheeching Agency district of Ontario twenty-five years.

Pokagon, Simon (Chief), Hartford, Michigan, November 10 and 16, 1898. Simon Pokagon was the last chief of the Potawatomi Indians. He died at his home in Hartford January 27, 1899.

Ramaley, Francis, Boulder, Colorado, December 9, 1898.

Reid, James G., Cheyenne River agency, South Dakota, November 11, 1898 (agent of Cheyenne River agency, South Dakota).

Richards, Thomas, Elbowoods, North Dakota, November 17, 1898 (agent of Fort Berthold agency).

Rodman, N. D., Reserve, Wisconsin, November 11, 1898, and February 14, March 1, 1899 (Government farmer, Lac Courte Oreilles reservation, Wisconsin).

Rolfs, P. H., Lake City, Florida, December 10 and 19, 1898.

Rumsey, W. E., Morgantown, West Virginia, December 17, 1898.

Saunders, D. W., Brookings, South Dakota, January 4, 1899.

Scribner, F. Lamson-, Washington, District of Columbia, April 25, 1899.

Shimek, B., Iowa City, Iowa, December 7, 1898.

Stephens, J. H., Crow Creek, South Dakota, November 16, 1898 (agent of Crow Creek agency, South Dakota).

Stuntz, A. C., Monroe, Wisconsin, November 24, 1898. Mr Stuntz was among the Ojibwa Indians in northern Wisconsin from the year 1848 until 1882.

Sutherland, John H., White Earth, Minnesota, December 14, 1898 (agent of White Earth agency, Minnesota).

Tourney, J. W., Tucson, Arizona, December 7, 1898.

Tracy, S. M., Agricultural College P. O., Mississippi, December 13, 1898.

Turner, James G. (M. D.), L'Anse, Michigan, December 7, 1898 (agent of the Mackinac agency, Michigan).

Tuttle, A. H., Charlottesville, Virginia, November 20, 1898, and January 19, 1899.

Wheeler, C. F., Lansing, Michigan, December 14, 1898.

Williamson, John P. (Reverend), Greenwood, South Dakota, November 30, 1898, and January 21, 1899. Mr Williamson and his father before him have been lifelong missionaries to the Dakota Indians.

Wilson, H. U., Chapel Hill, North Carolina, February 15, 1899.

Wooton, E. O., Mesilla Park, New Mexico, December 22, 1898.

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[1] Kindness of Mr Gardner P. Stickney, Milwaukee, Wisconsin.

CHRONOLOGIC LIST OF MAPS.

1670–71. Map published in Relations des Jésuites (1670–71), Dablon.
Before 1716. Map of North America, Herman Moll.
[1673.] Fac simile de la Carte du Père Marquette.
1687. Amphissimæ Regions Mississippi . . . after Hennepin.
1688. Une partie de la Carte oe L'Amerique Septentrionale en L'Annee 1688, par J. Baptiste Louis Franquentin HYDE DU Roy A Quebec en Canada. (Copy made by I. A. Lapham from Chicago Historical Collection, which was destroyed by the Chicago fire in 1871.)
1718. Le Canada, ou Nouvelle-France . . . (Paris).
1720. A New Map of the North Parts of America claimed by France, H. Moll.
1720. Moll's America, Herman Moll.
1730 (circa). America Septentrionalis, G. De L'Isle.
[1740 to 1750.] America, John Bowles & Son (London).
[1746.] Amerique Septentrionale, D'Arville.
1750. Amerique Septentrionale, L. Sr Robert De Vaugondy.
1750 (circa). A Map of the British Plantations on the Continent of North America, Henry Overton.
1755. Nieuwe Kaart van de Grootbrittanische Volkplantingen in Noord America, Isaak Tirion.
1755. Canada Louisiane et Terres Angloises, Le Sr D'Anville.
1776–78. Map with Carver's Travels.
[1778]. A New Map of the Western Parts of Virginia, Pennsylvania . . . Tho. Hutchins.
1791. Sketch of the Western Countries of Canada, 1791, with J. Long's Voyages and Travels, etc. (*see* Bibliography).
[1795]. A Map of the Western Part of the Territories belonging to the United States.
1799. States of America, J. Russell.
1796–1802. [Map of New Eng., New York, New Jersey, Penn., and parts of Canada.] London, A. Arrowsmith, Jan. 1, 1796. Additions, 1802.
1804. Map of the United States, Abraham Bradley, Junr.
1805. Map of the State of Ohio, Rufus Putnam, Surveyor-General of the United States.
1806. Lewis and Clarke's Map.
1816. Map of the United States, John Melish.
[1817]. United States of America, No. 55.
1820. Map of western end of Lake Superior, p. 105, in Schoolcraft's Summary o an expedition to the sources of the Mississippi (*see* Schoolcraft, in Bibliography).
1835. A Map of a portion of the Indian Country Lying East & West of Miss., foi the Topographical Bureau.
1835. Reconnoissance of the Minnay Sotor Watapah; or St Peters river [Minnesota river] to its sources, by G. W. Featherstonhaugh, U. S. Geologist (one of two maps accompanying Featherstonhaugh's Report of a Geological Reconnoissance, 1835).
1835. Map of the Surveyed Parts of Wisconsin Territory.
1836. Map of the Territory of Wisconsin, David H. Burr.
1836. Map of the Territories of Michigan and Ouisconsin, John Farmer.
1836. The Tourist's Pocket Map of Michigan, by J. H. Young; published by S. Augustus Mitchell. [Philadelphia.]
1837. Topographical Map of Wisconsin Territory, Robert T. Lyttle, Surveyor-General.
1838. Map of the Settled Part of Wisconsin and Iowa, Augustus Mitchell.

1839. Map of Wiskonsin Territory compiled from public Surveys, Capt. T. J. Cram.
1843. Hydrographical Basis of the Upper Mississippi River from observations, etc, J. N. Nichollet.
1844. Map of Wiskonsan, Charles Doty and Francis Hudson.
1848. United States of America, Sherman and Smith, New York.
1848. Farmer's 4th Sheet or Map of Wisconsin, Iowa and Northern Part of Illinois, John Farmer, Detroit.
1849. Map of the Territory of Minnesota, exhibiting route of the Expedition to the Red river of the North in the Summer of 1849, Capt. John Pope.
1850. General Karte der Vereinigten Staaten von Nord-Amerika, Albrecht Platt (after T. Calvin Smith's New York Karten).
1850. The State of Wisconsin, I. A. Lapham, Milwaukee.
1856. Map of Southern Minn. and Part of Wisconsin, Harris, Cowles & Co., Boston.
1857. Railroad map of Wisconsin, Rufus Blanchard, Chicago.
1860. Sectional Map of the Surveyed Portion of Minn. and Northwestern Part of Wis.
1861. Map Supplement to Illustrated London News, June 1st, 1861, of the United States of North America.
1862. Lloyd's New Map of United States, the Canadas, and New Brunswick.
1866. Blanchard's Map of the North Western States, Chicago.
1869. Blanchard's map of North Western States, Chicago.
1874. The Illustrated Historical Atlas of the State of Minnesota, 1874, Chicago.
1879. Department of Interior, General Land Office, State of Minnesota.
1892. Rand, McNally & Co.'s Sectional Map of Michigan, Chicago.
1892. Rand, McNally & Co.'s Sectional Map of Minnesota, Chicago.
1893. The Lake Region of Northern Wisconsin and Michigan, Ring, Fowle & Co., Milwaukee.
1894. Goodhue County Plat Book, 1894.
[1895]. Map of the Famous Hunting and Fishing Grounds embraced in the Lake Region of Michigan and Wisconsin, Poole Bros., Chicago.
1896. The Railroad Map of Wisconsin, D. J. McKenzie, Railroad Commissioner.

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